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conservation and open space element

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# THE HISTORY OF THE UNITED STATES

1776

The first part of the history of the United States is the period from 1776 to 1800. This period is characterized by the struggle for independence from Britain and the establishment of the new nation.

## THE STRUGGLE FOR INDEPENDENCE

The struggle for independence began in 1776 when the Continental Congress declared the United States independent from Britain. The war lasted until 1781 when the British evacuated New York City and moved to Philadelphia. The war ended with the signing of the Treaty of Paris in 1783, which recognized the United States as an independent nation.

## THE NEW NATION

The new nation was established in 1787 with the signing of the Constitution. The Constitution established a federal government with three branches: the executive, the legislative, and the judicial. The first president of the United States was George Washington.

The second part of the history of the United States is the period from 1800 to 1860. This period is characterized by the expansion of the United States and the struggle over slavery.

The third part of the history of the United States is the period from 1860 to 1900. This period is characterized by the Civil War and the Reconstruction era.

The fourth part of the history of the United States is the period from 1900 to 1945. This period is characterized by the Progressive Era and the Great Depression.

The fifth part of the history of the United States is the period from 1945 to 1980. This period is characterized by the Cold War and the Vietnam War.

The sixth part of the history of the United States is the period from 1980 to the present. This period is characterized by the Reagan Revolution and the 9/11 attacks.

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# Table 1

Year	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Population	100	105	110	115	120	125	130	135	140	145	150
GDP	100	105	110	115	120	125	130	135	140	145	150
Unemployment	5.0	5.5	6.0	6.5	7.0	7.5	8.0	8.5	9.0	9.5	10.0
Inflation	2.0	2.5	3.0	3.5	4.0	4.5	5.0	5.5	6.0	6.5	7.0
Interest Rate	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0	5.5	6.0
Trade Balance	0.0	0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0
Government Debt	0.0	0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0
Household Income	100	105	110	115	120	125	130	135	140	145	150
Life Expectancy	75	76	77	78	79	80	81	82	83	84	85
Healthcare Spending	100	105	110	115	120	125	130	135	140	145	150
Education Spending	100	105	110	115	120	125	130	135	140	145	150
Research & Development	100	105	110	115	120	125	130	135	140	145	150
Energy Production	100	105	110	115	120	125	130	135	140	145	150
Environmental Protection	100	105	110	115	120	125	130	135	140	145	150
Transportation Infrastructure	100	105	110	115	120	125	130	135	140	145	150
Information Technology	100	105	110	115	120	125	130	135	140	145	150
Space Exploration	100	105	110	115	120	125	130	135	140	145	150
Artificial Intelligence	100	105	110	115	120	125	130	135	140	145	150
Autonomous Vehicles	100	105	110	115	120	125	130	135	140	145	150
Renewable Energy	100	105	110	115	120	125	130	135	140	145	150
Carbon Footprint	100	105	110	115	120	125	130	135	140	145	150
Climate Change Mitigation	100	105	110	115	120	125	130	135	140	145	150
Disaster Preparedness	100	105	110	115	120	125	130	135	140	145	150
Public Safety	100	105	110	115	120	125	130	135	140	145	150
Law Enforcement	100	105	110	115	120	125	130	135	140	145	150
Justice System	100	105	110	115	120	125	130	135	140	145	150
Legal System	100	105	110	115	120	125	130	135	140	145	150
Political System	100	105	110	115	120	125	130	135	140	145	150
Media System	100	105	110	115	120	125	130	135	140	145	150
Religious System	100	105	110	115	120	125	130	135	140	145	150
Cultural System	100	105	110	115	120	125	130	135	140	145	150
Social System	100	105	110	115	120	125	130	135	140	145	150
Economic System	100	105	110	115	120	125	130	135	140	145	150
Political System	100	105	110	115	120	125	130	135	140	145	150
Media System	100	105	110	115	120	125	130	135	140	145	150
Religious System	100	105	110	115	120	125	130	135	140	145	150
Cultural System	100	105	110	115	120	125	130	135	140	145	150
Social System	100	105	110	115	120	125	130	135	140	145	150
Economic System	100	105	110	115	120	125	130	135	140	145	150

# Table 2

Year	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Population	100	105	110	115	120	125	130	135	140	145	150
GDP	100	105	110	115	120	125	130	135	140	145	150
Unemployment	5.0	5.5	6.0	6.5	7.0	7.5	8.0	8.5	9.0	9.5	10.0
Inflation	2.0	2.5	3.0	3.5	4.0	4.5	5.0	5.5	6.0	6.5	7.0
Interest Rate	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0	5.5	6.0
Trade Balance	0.0	0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0
Government Debt	0.0	0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0
Household Income	100	105	110	115	120	125	130	135	140	145	150
Life Expectancy	75	76	77	78	79	80	81	82	83	84	85
Healthcare Spending	100	105	110	115	120	125	130	135	140	145	150
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Research & Development	100	105	110	115	120	125	130	135	140	145	150
Energy Production	100	105	110	115	120	125	130	135	140	145	150
Environmental Protection	100	105	110	115	120	125	130	135	140	145	150
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Renewable Energy	100	105	110	115	120	125	130	135	140	145	150
Carbon Footprint	100	105	110	115	120	125	130	135	140	145	150
Climate Change Mitigation	100	105	110	115	120	125	130	135	140	145	150
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Justice System	100	105	110	115	120	125	130	135	140	145	150
Legal System	100	105	110	115	120	125	130	135	140	145	150
Political System	100	105	110	115	120	125	130	135	140	145	150
Media System	100	105	110	115	120	125	130	135	140	145	150
Religious System	100	105	110	115	120	125	130	135	140	145	150
Cultural System	100	105	110	115	120	125	130	135	140	145	150
Social System	100	105	110	115	120	125	130	135	140	145	150
Economic System	100	105	110	115	120	125	130	135	140	145	150



## IMPERIAL COUNTY GENERAL PLAN CONSERVATION AND OPEN SPACE ELEMENT

### I. INTRODUCTION

#### A. Preface

The County of Imperial is rich in natural and cultural resources. The landscape is dominated by native desert habitat and stark topographic features. Prime soils, Colorado River water, and year-round sunlight facilitate productive agricultural operations. Natural mineral resources are extracted for commercial purposes. The wide expanses of open space are useful for military maneuvers and recreational activities.

Population growth and subsequent development have intensified the rate of resource use and regional environmental degradation. Urban expansion is decreasing the amount of land available for agriculture and mineral extraction. The pollution of air and water has diminished regional aesthetics, limited recreational opportunities, and threatened public health. Native desert biological communities are being impacted by accelerated human activity in Imperial Valley.

Two mandatory elements of the County's General Plan are addressed in the Conservation and Open Space Element and it fulfills the requirements of pertinent State legislation (Conservation Element--Government Code Sections 65302(d), and Public Resources Code Sections 2762 and 2763; Open Space Element--Government Code Sections 65302(e) and 65560, et seq. and Public Resources Code Section 5076). The Conservation and Open Space Element is the official conservation guide for all decision makers including the County Board of Supervisors, Planning Commission, Airport Land Use Commission, and various Departments in addition to other federal, state, or local governmental decision-making bodies. It shall also serve as a guide to the private sector, business community, investors, and developers in the County.

This Conservation and Open Space Element is concerned with the following environmental resources:

- Biological Resources
- Cultural Resources
- Soils
- Minerals
- Energy
- Regional Aesthetics
- Air Quality
- Open Space

Separate elements have been prepared for the conservation of water, agricultural, and geothermal resources. These three types of resources are critical to the long-term economic stability of Imperial County. In addition, the issues surrounding these resources are particularly complex. The Water Element, Agricultural Element, and Geothermal and Transmission Element contain focused goals and objectives, and an implementation program specific to each resource.

# RESEARCH REPORT: THE EFFECTS OF THE 2008 FINANCIAL CRISIS ON THE UK ECONOMY

## 1. INTRODUCTION

### 1.1. Background

The purpose of this report is to provide a comprehensive overview of the economic impact of the 2008 financial crisis on the United Kingdom. The report will examine the causes of the crisis, the immediate and long-term effects on the UK economy, and the government's response to the crisis. The report will also discuss the impact of the crisis on different sectors of the economy and on different groups of people.

The report will be structured as follows. Section 1.1 provides a brief overview of the background of the crisis. Section 1.2 discusses the causes of the crisis. Section 1.3 examines the immediate effects of the crisis on the UK economy. Section 1.4 discusses the long-term effects of the crisis on the UK economy. Section 1.5 discusses the government's response to the crisis. Section 1.6 discusses the impact of the crisis on different sectors of the economy and on different groups of people.

The financial crisis of 2008 was a global event that had a profound impact on the UK economy. The crisis was caused by a combination of factors, including the subprime mortgage crisis in the United States, the collapse of Lehman Brothers, and the failure of the London Interbank Offered Rate (LIBOR). The immediate effects of the crisis on the UK economy were a sharp decline in GDP, a rise in unemployment, and a loss of confidence in the financial system. The long-term effects of the crisis on the UK economy have been a slow recovery, a rise in government debt, and a loss of confidence in the financial system. The government's response to the crisis has been to implement a series of measures, including a bank bail-out, a stimulus package, and a series of interest rate cuts. The impact of the crisis on different sectors of the economy and on different groups of people has been uneven, with some sectors and groups of people experiencing a more severe impact than others.

The following table provides a summary of the key findings of the report:

Key Finding	Impact
Causes of the crisis	Subprime mortgage crisis, collapse of Lehman Brothers, failure of LIBOR
Immediate effects	Sharp decline in GDP, rise in unemployment, loss of confidence in financial system
Long-term effects	Slow recovery, rise in government debt, loss of confidence in financial system
Government response	Bank bail-out, stimulus package, interest rate cuts
Impact on different sectors	Uneven impact, with some sectors experiencing a more severe impact than others
Impact on different groups of people	Uneven impact, with some groups of people experiencing a more severe impact than others

The report concludes that the 2008 financial crisis had a profound impact on the UK economy. The crisis was caused by a combination of factors, including the subprime mortgage crisis in the United States, the collapse of Lehman Brothers, and the failure of the London Interbank Offered Rate (LIBOR). The immediate effects of the crisis on the UK economy were a sharp decline in GDP, a rise in unemployment, and a loss of confidence in the financial system. The long-term effects of the crisis on the UK economy have been a slow recovery, a rise in government debt, and a loss of confidence in the financial system. The government's response to the crisis has been to implement a series of measures, including a bank bail-out, a stimulus package, and a series of interest rate cuts. The impact of the crisis on different sectors of the economy and on different groups of people has been uneven, with some sectors and groups of people experiencing a more severe impact than others.



The implementation of this Element does not negate the environmental review process required by the California Environmental Quality Act (CEQA) and the National Environmental Protection Act (NEPA). While a proposed project may conform to the Conservation and Open Space Element, it is still subject to impact assessment pursuant to CEQA and NEPA. This Element supports environmental review for proposed projects in addition to determining the extent that proposed projects promote the Element goals and objectives.

## **B. Purpose of the Element**

The County is charged with the responsibility of conserving environmental resources while encouraging economic development and growth. The Conservation and Open Space Element identifies goals and policies to insure the managed use of environmental resources. The goals and policies are also designed to prevent limiting the range of resources available to future generations.

The purpose of the Conservation and Open Space Element is to:

- Promote the protection, maintenance, and use the County's natural resources with particular emphasis on scarce resources and resources that require special control and management.
- Prevent the wasteful exploitation, destruction, and neglect of the State's natural resources.
- Recognize that natural resources must be maintained for their ecological value as well as for the direct benefit to the public.
- Protect open space for the preservation of natural resources, the managed production of resources, outdoor recreation, and public health and safety.

## **C. Applicability**

The Conservation and Open Space Element applies to all unincorporated land within the County of Imperial. Each incorporated City must adopt its own general plan and subsequent conservation and open space elements. It is the intent of the County to be consistent and supportive of complementary plans of incorporated areas. Since natural resources characteristically cross political boundaries, planning for the use and conservation of resources requires cooperation between various governmental divisions and departments. When an area falls under more than one jurisdiction, each should consider the Conservation and Open Space Element goals and programs of the other jurisdiction when making decisions. All public and private projects are subject to this Element.

It is not the intent of this Element to impose any restriction on the use of any private land which would constitute a taking or a damaging of property for public use. This type of action might require payment or just compensation for damages. In the event that the County Board of Supervisors, Planning Commission, or an official of the County determines that the application of any provision of this Element to any private property constitutes such a taking, the restrictions should be modified or waived to the extent necessary to avoid the taking or damaging. It is specifically not the intent of this Element to preclude the placement, construction, or the use of one single-family residence on any parcel that existed as a legal parcel of record at the time of the adoption of the Element, and no individual or

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## 2. Purpose of the Document

The purpose of this document is to provide information about the project and the data entered. The information is provided for your information only and should not be used for any other purpose. The information is provided for your information only and should not be used for any other purpose.

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## 3. Appendix

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public safety hazard or danger would result from such placement or construction. Furthermore, the inventory of conservation issues and subsequent policy discussed in this Element are not intended to be all inclusive and may be amended when additional information or studies become available or are required.





## **II. EXISTING CONDITIONS AND TRENDS**

### **A. Preface**

This report focuses on specific environmental resources in Imperial County, including biological and cultural resources, soils, minerals, energy, regional aesthetics, air quality, and open space. Additional information on mineral and soil resources is located in Appendix A.

### **B. Biological Resources**

#### **1. Plants and Vegetative Habitats**

Figure 1 shows the distribution of major vegetation types throughout the County. A broad range of biotic communities have been identified in Imperial County, ranging from those dependent upon the river ecology of the Colorado to the saltbush-alkali scrub habitats. The predominant plant community in the County is cultivated/ruderal, and is associated with agricultural and other human activities. This plant community, which consists of cropland, pasture land and orchards, is most widespread in the Imperial Valley. The Valley floor historically consisted of a creosote scrub plant community, but was replaced by agricultural activity after 1900. The dominant crops now being cultivated in the Valley include cotton, chard, lettuce, and alfalfa.

Agricultural activities have encouraged the spread of opportunistic plant species including weedy varieties and larger plants, such as salt cedar, most of which are not native to the area. The Valley floor consists largely of non-native and introduced plants, including date palms, a variety of grasses, and ornamental specimen trees and shrubs.

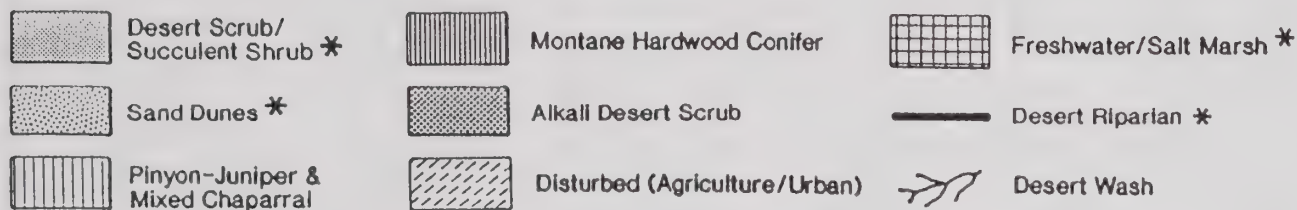
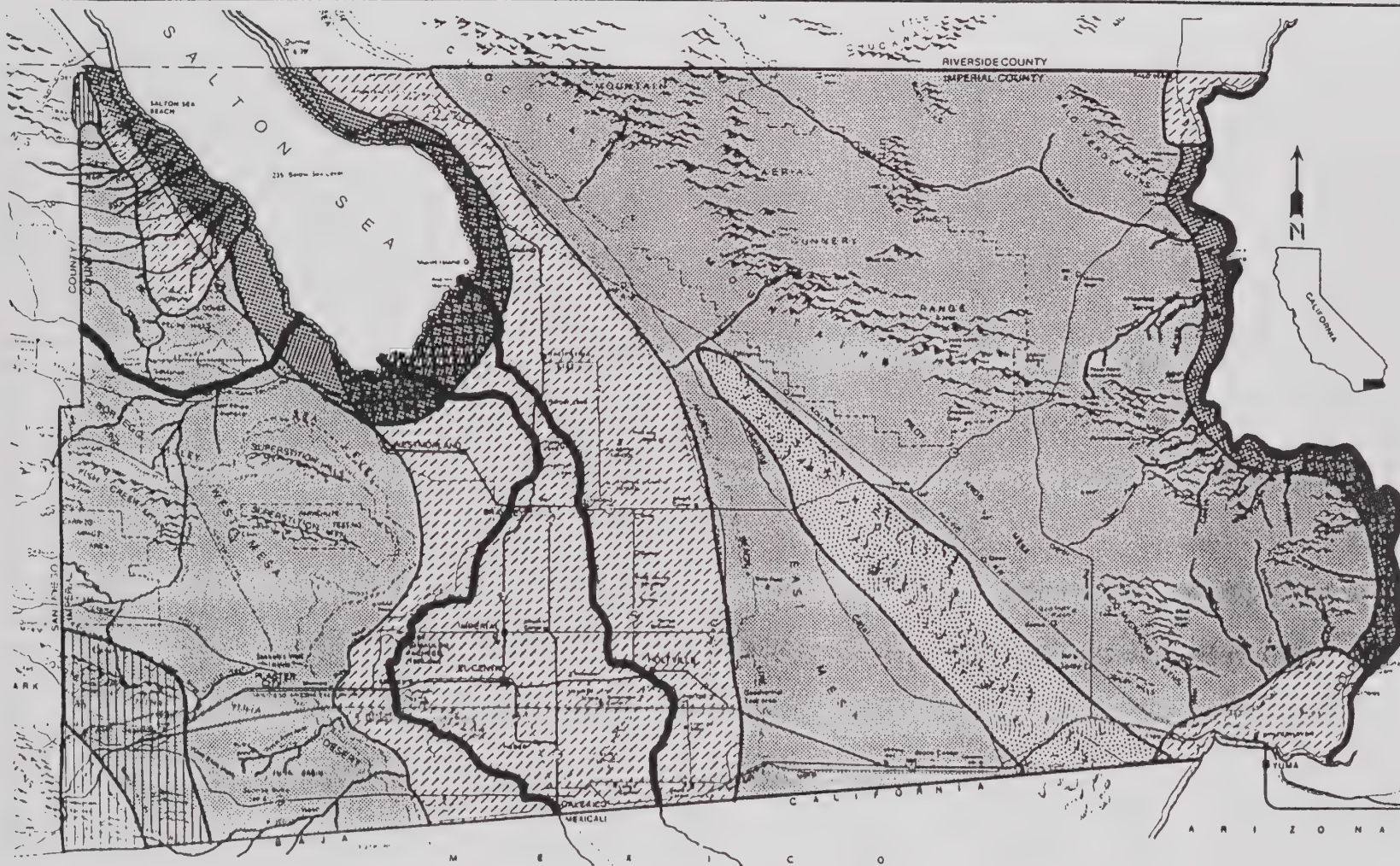
The term "ruderal" refers to the type of vegetation which grows in response to human disturbance: along roadsides, at the borders of cultivated fields, and in canal riparian/levee areas. This generally weedy vegetation can intrude rapidly into moist and periodically disturbed areas, and includes such plants as cheeseweed, shepherds purse, white horse-nettle, saltbush, saltcedar, Russian thistle, Bermuda grass and other opportunistic plants.

The undeveloped portions of the County support limited and much more specialized native plant communities. Where naturally occurring sources of water are available, special and often unique communities thrive. Eleven indigenous plant communities are identified within the County: desert riparian (cottonwood-willow), fresh emergent wetlands (freshwater marsh), alluvial washes, palm oases, desert scrub (creosotebush), desert succulent shrub, alkali desert scrub (saltbush), sand dune, mixed chaparral, pinyon-juniper, and montane hardwood-conifer.

The waterways of the Colorado River, the All-American Canal, the Alamo River and the New River support riparian and freshwater marsh habitats. Characteristic wetland plant species associated with these habitats include willows, western cottonwood, mesquite, velvet ash, tamarisk, big-leaf sedge, cattails, baltic rush, and bulrushes in the overstory; quailbush, Mojave seabligh, desert lavender, seep willow, red-root nutgrass, saltgrass, and arrowweed in the understory; as well as a variety of weedy species such as ripgutgrass, dallisgrass, mustard, telegraphweed, curly dock, spiny clothur, western ragweed, white sweetclover, wild lettuce, and doveweed.







\* SENSITIVE  
HABITATS

0 6 12 miles



Imperial County  
General Plan

Imperial County Habitat Map

Figure  
1

Conservation and Open Space Element





Desert wash habitats are characterized by the presence of arborescent, often spiny, shrubs generally associated with intermittent streams (washes) or alluvial deposits adjacent to washes. This habitat occurs throughout the drier portions of the County, outside of the Imperial Valley. Canopy species typically found in washes include palo verde, desert ironwood, smoketree, cat-claw acacia, mesquite, and tamarisk. Plants of the subcanopy include desert broom, desert willow, crucillo, Anderson's wolfberry, and arrowweed. Groundcover species include white brittlebush, desert goldenbush, saltbush, barrel cactus, white bursage, desert lavender, snakeweed, as well as a variety of forbs and grasses.

All natural or naturalized plant assemblages that include California fan palms are recognized as palm oasis habitats. This habitat exists at localized sites around the Salton Sea basin where the following soil and water requirements are met: moist alkaline soils near seeps, springs and permanent streams.

Coyote willow, western cottonwood, California sycamore, velvet ash, mesquite and tamarisk are other tree species associated with fan palms. Understory species include alkali goldenbush, squaw waterweed and arrowweed. Forbs and grasses include alkali sacaton and wiregrass.

Desert scrub is the most widespread habitat in the California deserts. They are well-developed on valley floors and alluvial deposits adjacent to washes. Creosotebush is generally the dominant plant species in this habitat. Other species include saltbush, indigo bush, desert goldenbush, white brittlebush, burrobush, white bursage, cat-claw acacia, bladderpod, desert agave, barrel and hedgehog cactus, branched pencil and teddybear cholla, Palmer's coldenia, Wiggin's croton, desert globemallow, jojoba, little-leaf krameria, ocotillo, beavertail, prickly-pear, Douglas and rubber rabbitbrush, desert sand verbena, desert senna, squaw waterweed, Anderson's wolfberry, and Mojave yucca. Forbs and grasses include triangle evening primrose, big galletagrass and Spanish-needles.

Desert succulent shrub habitats are generally found on southfacing slopes, with rocky soils that are well-drained. These succulent-dominated stands are usually denser than creosotebush, and constituent plants are more evenly spaced. Shrub dominants include ocotillo, Mojave yucca, desert agave, buck-thorn cholla, branched pencil and teddybear cholla, grizzlybear and beavertail pricklypear, barrel and hedgehog cactus, and saguaro. Nonsucculent subshrubs typically comprise the understory.

Alkali scrub habitats can generally be found surrounding the receding shores of large prehistoric lakes or alkali playas that mark the locations of dry lake beds. It also occurs along the Colorado River, particularly in areas of old river bed meanders. This habitat is subdivided into a xerophytic phase, which generally consists of species with low salt tolerance, and a holophytic phase, or more salt-tolerant species which exhibit varying degrees of succulence. The diversity of cacti and other succulents is relatively low.

The dunes of the Sand Hills Ecological Area in south-central Imperial County contain many important plant species that have adapted to the extreme arid conditions. Some examples of rare and/or endangered plant species in this area are the Peirson's milk-vetch, Wiggins' croton and Algodones Dunes sunflower. Other sand dune species include yellow spiderwort, desert dicoria, dune primrose, and plicate coldenia.

The mixed chaparral and pinyon-juniper habitats are restricted to a small, overlapping area in the extreme southwestern corner of Imperial County, in the Jacumba Mountains adjacent to the San Diego





County line. Generally found on north-facing slopes in southern California, mixed chaparral supports approximately 240 species of woody plants. Characteristic species found on transmontane slopes include shrub live oak, desert ceanothus, desert bitterbrush, bigberry manzanita, chamise, birch-leaf mountain mahogany, California fremontia, and wild lilac. Natural California fan palms are also found in the Jacumba Mountains.

The pinyon-juniper habitat is generally found on east-facing slopes and at higher elevations than mixed chaparral. Characteristic canopy species include single-leaf and Parry's pinyon, western and California juniper, oaks, and Mojave yucca. Subcanopy plants include big sagebrush, blackbrush, narrow-leaf goldenbush, Parry's nolina, curly-leaf mountain mahogany, antelope bitterbrush, Parry's rabbitbrush, chamise, and snakeweed. Grasses and forbs associated with this habitat include western wheatgrass, blue grama and Indian ricegrass.

As with the mixed chaparral and pinyon-juniper habitats discussed above, the montane hardwood-conifer forest is restricted to a small area in the extreme northwestern corner of Imperial County, in the Santa Rosa Mountains adjacent to the Riverside County line. Common plant associations for this habitat type found in the Transverse Mountain Range of southern California include Pacific madrone, oaks, ponderosa and sugar pine, and incense-cedar.

## **2. Wildlife**

The conditions created by the arid desert climate and continued expansion of agriculture have resulted in an abundance and diversity of wildlife habitats that vary substantially across Imperial County. Many species occurring in the County are highly localized and are dependent upon the type of vegetative communities available. For example, the Imperial Valley provides a dramatic mix of arid desert and water-oriented habitat areas which support a broad range of native and introduced year-round and migrant animal species. The sizable areas in active cultivation also provide important foraging habitat for numerous birds and small mammals.

## **Fish**

The Salton Sea is home to at least twelve species of fish which have been introduced either directly by the California Department of Fish and Game (CDFG) and federal Bureau of Land Management (BLM) biologists or indirectly through migration from local irrigation canals. Very few fish can tolerate the high salinity of the Salton Sea. The introduction of several species of marine fish into the Salton Sea in 1950 resulted in the largest inland fishery in California. Some of these introduced saltwater species include orangemouth corvina, sargo, gulf croaker, sailfin molly, longjaw mudsucker, and tilapia. The endangered desert pupfish is a native fish found around the fringes of the Salton Sea; within the San Felipe and Whitewater Creeks which feed into it.

Freshwater fish are found in rivers, canals and some marsh areas. Some of the introduced species include threadfin shad, mosquitofish, red shiner, California killifish, largemouth bass, white and channel catfish. Tilapia is found in both fresh and saltwater. Native freshwater fish species include the endangered Colorado squawfish, bonytail chub and humpback sucker.





## **Amphibians and Reptiles**

Some of the amphibian species found in or near freshwater habitats of Imperial County include the Colorado river toad, red-spotted toad, California red-legged frog, leopard frog, bullfrog, and spiny softshell turtle.

Desert scrub and rocky outcrops throughout the County provide excellent burrowing, foraging, and boulder habitat for a variety of reptiles. Typical reptile species include the chuckwalla, banded and magic geckos, western iguana, desert horned lizard, flat-tailed horned lizard, zebra-tailed lizard, long-tailed brush lizard, long-nosed leopard lizard, Colorado fringe-toed lizard, collared lizard, side-blotched lizard, desert spiny lizard, western whiptail lizard, western rattlesnake, sidewinder, red racer, common kingsnake, gopher snake, checkered garter snake, western blind snake, western patch-nosed snake, western ground snake, desert glossy snake, and desert tortoise.

## **Birds**

Imperial County is located on one of the most important flyway corridors in the western hemisphere for migrant waterfowl, shorebirds and songbirds. Generally, the greatest numbers and diversity of birds are found during the spring and fall months. The variety and diversity of bird species is greater than for most animals, undoubtedly due to their high degree of mobility and broad foraging habits.

Approximately 378 species of birds have been identified in Imperial County, as compared to only 41 species of mammals and 31 species of reptiles and amphibians. The food potential of cultivated areas is the main contributor to the broad range of bird species frequenting the County. Some of the species associated with these agricultural areas include waterfowl, gulls, herons, egrets, doves, Gambel's quail, sparrows, finches, and juncos. Raptors include the marsh hawk, red-tailed hawk and burrowing owl.

Flocks of ring-billed gulls, red-winged black birds, and cattle egrets will frequent area agricultural fields after recent harvests or plowing.

The presence of the Salton Sea, rivers, canals, drainage ditches and fish farms offer attractive food sources, nesting and resting sites for many bird species. The importance of the relatively rare desert riparian systems, freshwater marshes, palm oases, and alluvial washes in supporting wildlife populations cannot be overstated. These habitats support more bird species at greater densities than other desert habitats.

The diversity of bird species is relatively low in desert scrub habitats. The restricted areas of mixed chaparral, pinyon-juniper and montane hardwood-conifer habitats found along the western San Diego/Imperial County boundary offer valuable food sources, cover, nesting, roosting and foraging opportunities for many bird species.

## **Mammals**

Most indigenous medium and large-sized mammals, such as foxes, coyotes and badgers, have disappeared from the Valley floor, but can still be found in relatively undisturbed areas near sources of water. Coyotes are often found around orchards, where they feed on fruit and small mammals. Smaller mammals have adapted better to the intense human activity in the Valley, especially small rodent species capable of exploiting marginal habitats along canals, agricultural drains, roadsides, and around buildings. Some of these rodents include the western harvest mouse, Norway and black rat,



valley pocket gopher, and muskrat. The striped and spotted skunk is also common in the Imperial Valley. Raccoons are strongly associated with water, and may also be attracted to the Valley floor due to the presence of agricultural canals. Brush rabbit is likely to feed on various non-native grasses and small plants within the Valley. Finally, many species of bats, some residents to the area and others migrants, are found in the Valley due to the presence of fruit, fruit flies and agricultural canals, which provide excellent foraging areas for insects as well as functioning as reliable water sources.

Characteristic mammalian species found in native desert scrub habitats surrounding the Imperial Valley and Salton Sea include cactus and deer mouse, desert and spiny pocket mouse, little and long-tailed pocket mouse, desert and Merriam kangaroo rat, desert and whitethroated woodrat, Arizona and hispid cottonrat, white-tailed antelope and roundtail ground squirrel, desert and blacktail jackrabbit, desert cottontail, desert shrew, desert kit and gray fox, bobcat, wild burro, mule deer, and peninsular and Nelson's bighorn sheep.

### 3. Sensitive Species and Habitats

Figures 2a, 2b, and 2c show general locations where sensitive plant and animal species have been identified, and the extent of sensitive habitats within Imperial County. Figure 3 shows "Resource Areas" which have been identified by state and federal agencies.

#### Plants

Sensitive plant species are determined by their rarity, endangerment and limited distribution. There are three listing authorities for sensitive plants in California: the California Native Plant Society (CNPS), a private organization; the CDFG; and the U.S. Fish and Wildlife Service (USFWS). Of the 28 sensitive plant species in Imperial County, the following three are officially listed as "Rare", "Threatened", or "Endangered" by either the USFWS and CDFG: Pierson's milk-verbena, Wiggins' croton and Algodones Dunes sunflower.

Twenty-five plants are considered "Rare, Threatened, or Endangered" by the CNPS, or are placed in a "Watch List" by the USFWS and/or CNPS. These include sand-foam, California ayenia, elephant tree, Dunn's mariposa, two species of lip fern, Las Animas colubrina, foxtail cactus, Gander's cryptantha, Parish's larkspur, California ditaxis, desert tea, wild buckwheat, San Diego cryote thistle, flat-seeded spurge, Tecate tarplant, crucifixion thorns, Mountain Springs bush lupine, Masom Valley cholla, Munz's cholla, Wiggins' cholla, giant Spanish-needle, Thurber's sandpaper-plant, Orocoya sage, and Orcutt's woody aster.

#### Fish

All four native fish species occurring within Imperial County are listed as "Endangered" by the CDFG. The bonytail chub, desert pupfish and Colorado squawfish are also listed as "Endangered" by the USFWS. The humpback (or razorback) sucker is a Category 1 candidate for the federal "Endangered" species list. As mentioned, the desert pupfish occurs within the San Felipe and Whitewater Creeks which feed into the Salton Sea, and the other freshwater fish are found in rivers, canals and marsh areas.





Figure 2a

Sensitive Plants






	Pierson's Milk-Vetch
	Munz's Cactus
	Sand Food
	Orcutt's Aster
	Orocopia Sage
①	Algodones Dunes Sunflower
②	Wiggins' Croton
③	Wiggins' Cholla
④	Mountain Springs Bush Lupine

Figure 2b

Sensitive Wildlife Areas

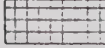

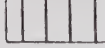





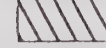
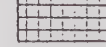


	Desert Bighorn Sheep
	Golden Eagle
	Potential Desert Tortoise Habitat
	Large Areas of Sensitive Animal Species
Ⓐ	Andrew's Dune Scarab Beetle
Ⓒ	California Black Rail
Ⓜ	Barefoot Banded Gecko
Ⓨ	Yuma Clapper Rail
Ⓟ	Desert Pupfish
Ⓑ	Brown Pelican, Aleutain Canada Goose, Bald Eagle, Osprey, Peregrine Falcon
Ⓔ	Sandhill Crane
←--→	Probable Wildlife Corridors
↔	Known Wildlife Corridors
	Flat-tailed Horned Lizard (See Figure 13 for Current Range)

Figure 2c

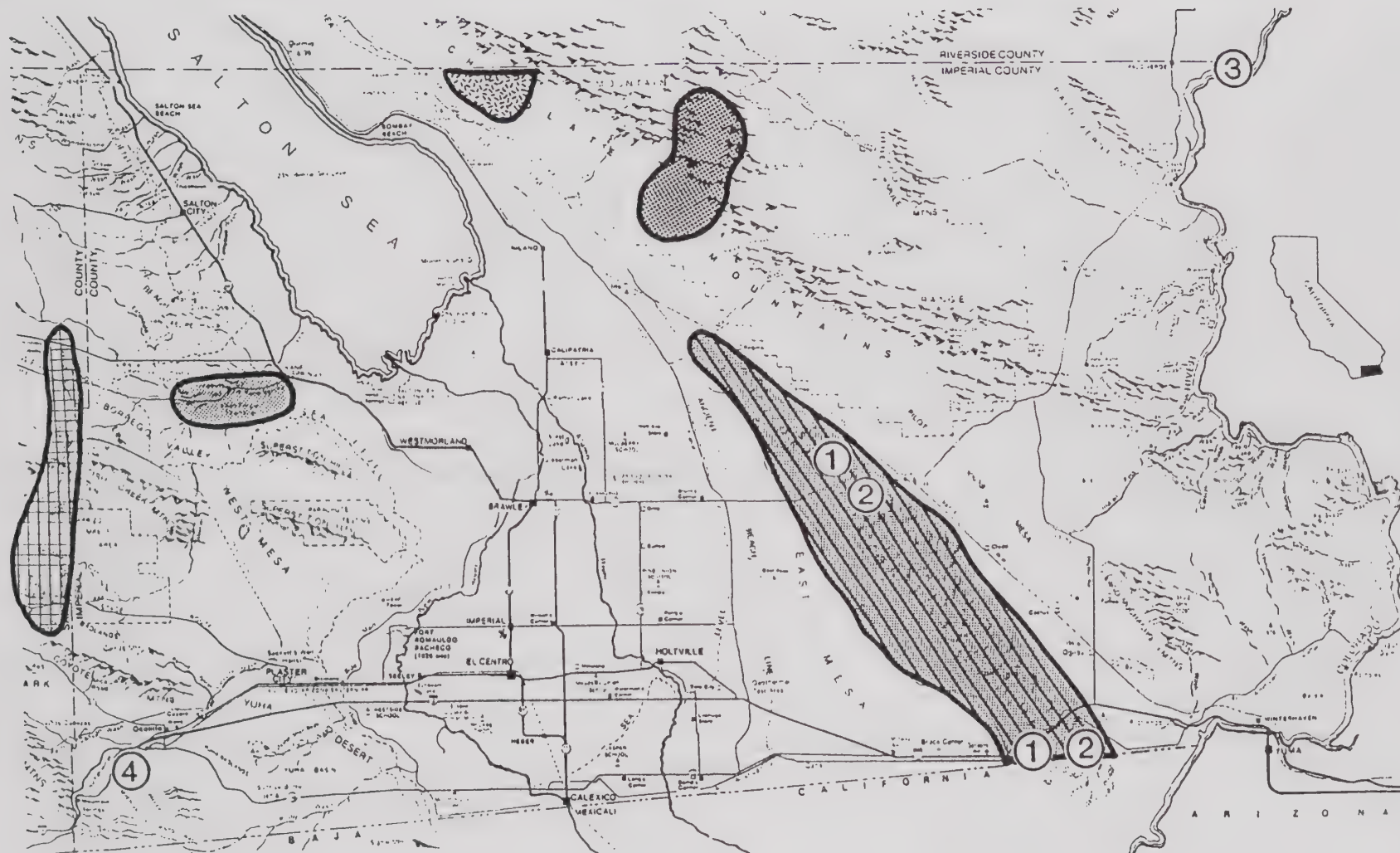
Unusual Plant Assemblages

	Mountain Springs Grade Blackbrush
	Smugglers Cave Chaparral
	Chocolate Mountains Munz Cholla
	Yuha Desert Crucifixion Thorn
	Mesquite Hummocks*
	Davies Valley Succulent Scrub
	Imperial Sand Dunes
	Picacho Peak/Chocolate Mountains All-Thorn

\* (any Mesquite Hummock in the  
County is considered a UPA)







0 6 12 miles



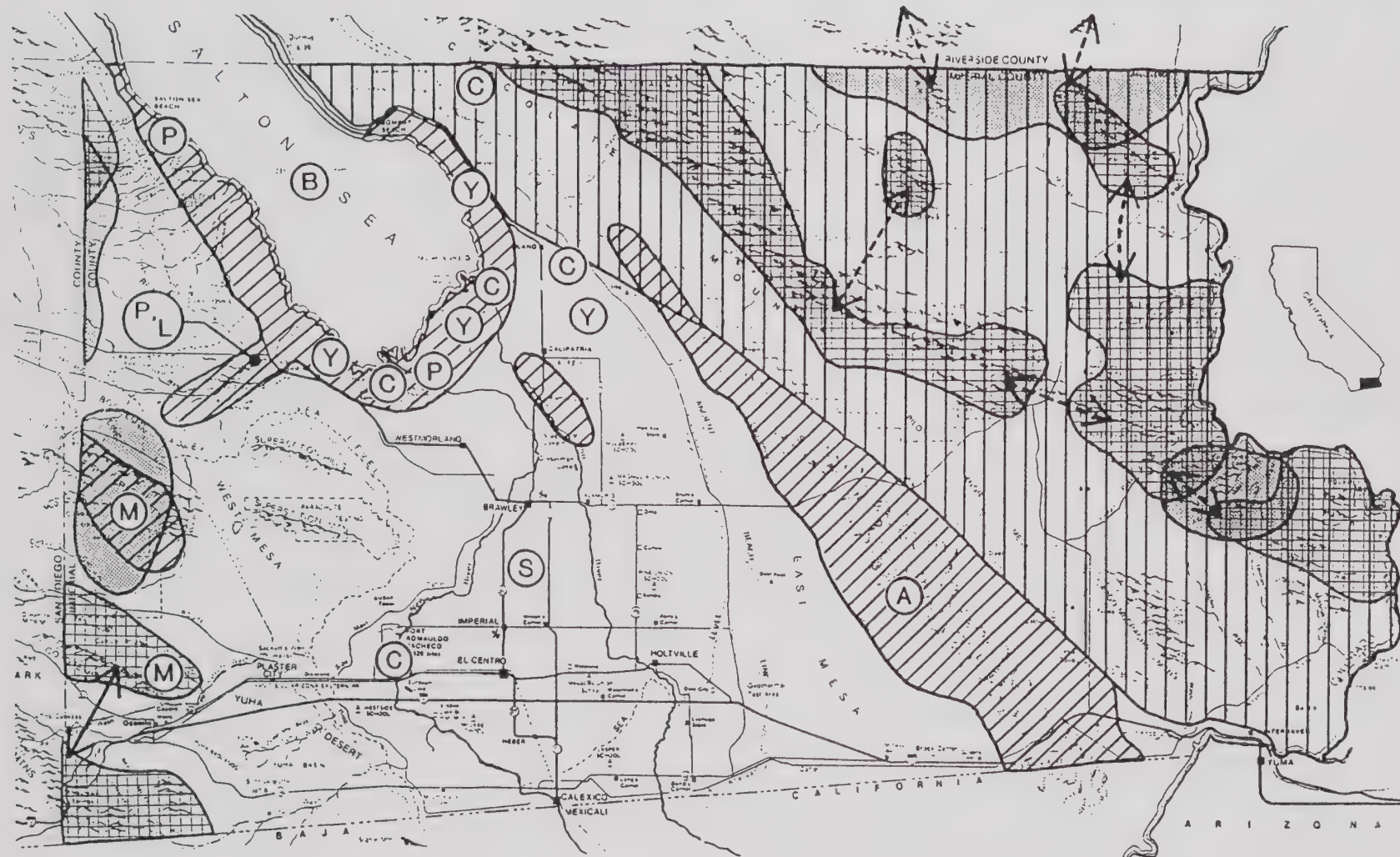
Imperial County  
General Plan

Sensitive Plants

Conservation and Open Space Element

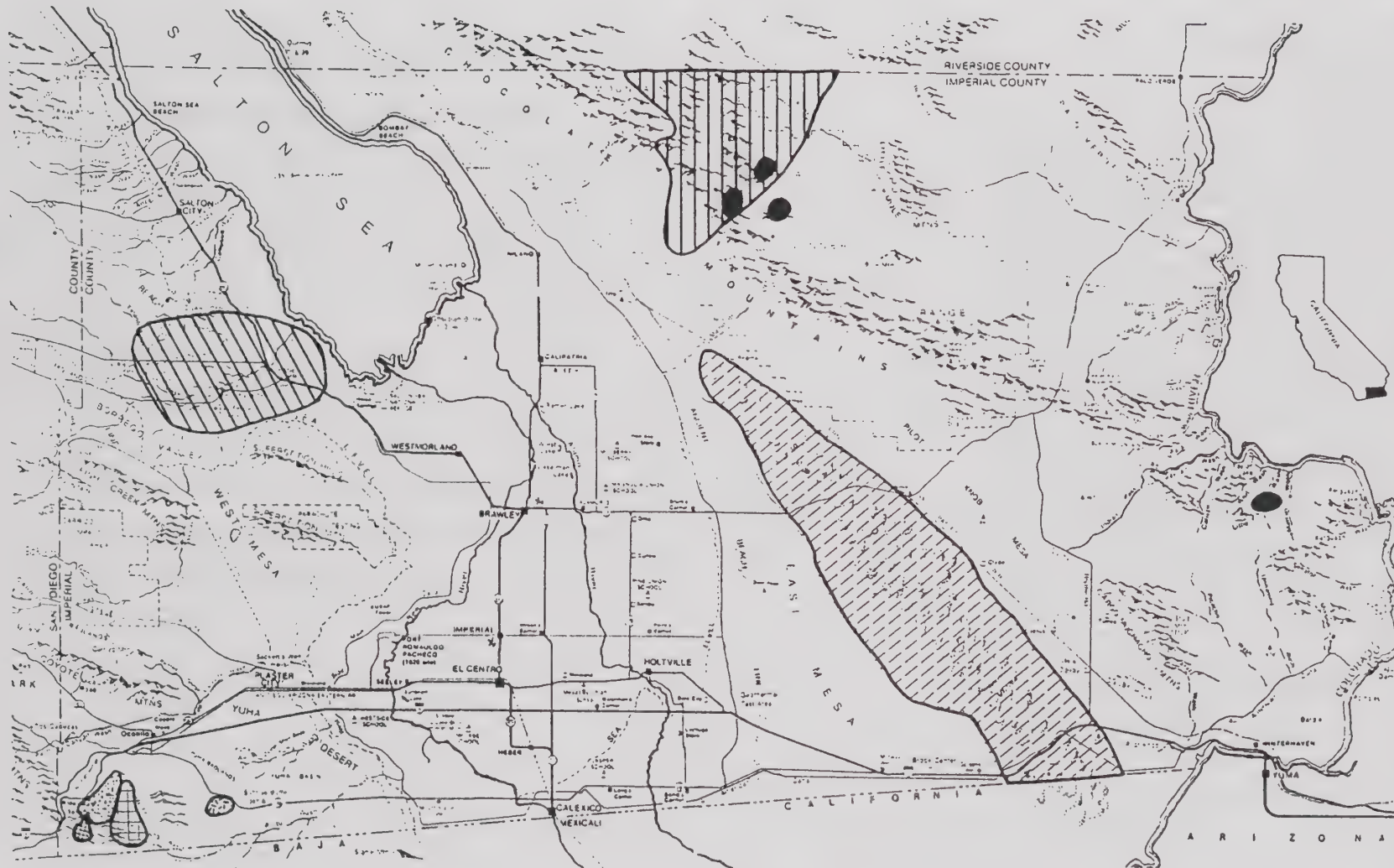
Figure  
2a











0 6 12 miles



Imperial County  
General Plan

Unusual Plant Assemblages

Conservation and Open Space Element

Figure  
2c







Areas of Critical Environmental Concern (ACEC)  
and Wildlife Habitat Areas (WHA)

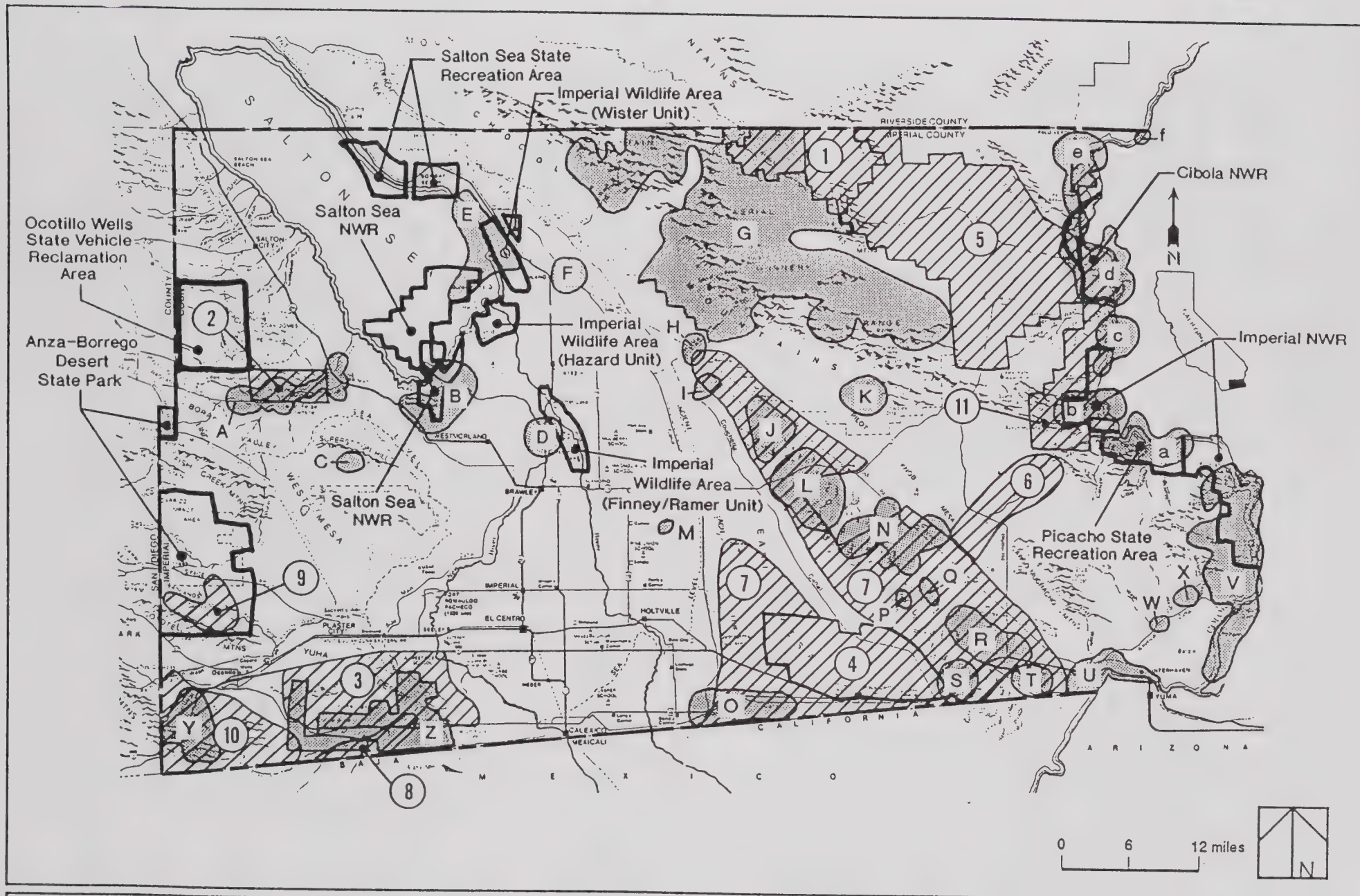
- ① Chuckwalla Bench (Desert Tortoise) ACEC
- ② San Sebastian Marsh/San Felipe Creek (Desert Pupfish) ACEC
- ③ Yuha Basin ACEC
- ④ East Mesa (Flat-Tailed Horned Lizard) ACEC
- ⑤ Milpitas Wash WHA
- ⑥ Indian Wash WHA
- ⑦ Algodones Dunes WHA
- ⑧ Pinto Wash WHA
- ⑨ Coyote Mountains/Davies Valley (Barefoot Banded Gecko) WHA
- ⑩ Smuggler's Cave (Southern Mixed Chaparral) WHA
- ⑪ Picacho Special Attention Area



Significant Natural Areas (SNA)

- A San Sebastian Marsh SNA
- B New River SNA
- C Superstition Hills SNA
- D Ramer and Finney Lakes SNA
- E Mullet Island SNA
- F Camp Dunlop SNA
- G Chocolate Mountains SNA
- H Tortuga Sand Hills SNA
- I Amos Sand Hills SNA
- J Acolita Sand Hills SNA
- K Glamis Buttes SNA
- L East Mesa Imperial Sand Dunes SNA
- M Holtville Drain SNA
- N Central Imperial Sand Dunes SNA
- O All American Canal SNA
- P Cactus Southwest Dunes SNA
- Q Pilot Knob Mesa West SNA
- R Ogilby Dunes SNA
- S Plank Road SNA
- T Southern Edge Pilot Knob Mesa SNA
- U Yuma Riverbend SNA
- V Ferguson Lake/Imperial Dam SNA
- W Ross Corner SNA
- X Bard Riverbend SNA
- Y In-Ko-Pah Gorge/Pinto Drainage SNA
- Z Crucifixion Thorn SNA
- a Picacho/Taylor and Adobe Lakes SNA
- b Julian/Carrizo Washes SNA
- c Draper SNA
- d Cibola/Gilmore's Landing SNA
- e Palo Verde Valley SNA
- f 38th Street Park SNA





Imperial County  
General Plan

Resource Areas

Conservation and Open Space Element

Figure  
3





## Amphibians and Reptiles

Two amphibian species occurring within or near permanent water sources in Imperial County are listed as "Species of Special Concern" by the CDFG; Colorado river toad and California red-legged frog.

The California red-legged frog is also a Category 2 candidate for the federal "Endangered" species list. Four reptilian species within the Imperial Valley are considered sensitive. The desert tortoise is listed as "Threatened" by both the USFWS and CDFG. The barefoot banded gecko is also a State-listed "Threatened" species, but it is on the federal "Endangered" (Category 2) candidate list. The flat-tailed horned lizard is listed as "Threatened" by CDFG, and is also a Category 1 candidate for the federal "Endangered" species list. The Colorado Desert fringe-toed lizard is listed as "Species of Special Concern" by CDFG, and is a Category 2 candidate for the federal "Endangered" species list.

The status of the flat-tailed horned lizard was recently reviewed by both the USFWS and CDFG. In 1990, the federal status of this species was elevated from Category 2 to Category 1 after extensive monitoring by BLM between 1984-86 indicated severe population declines in three out of four special habitat management areas, or Areas of Critical Environmental Concern (ACEC), in the California Desert Conservation Area. These continuing declines are primarily due to significant habitat modification and destruction from recreational and other urban developments, such as off-highway vehicle activity, geothermal, oil and gas development, gold mining, construction of roads and power transmission lines, sand and gravel extraction, pesticide spraying, and habitat fragmentation.

In 1989, the State status of the flat-tailed horned lizard was elevated from "Species of Special Concern" to "Threatened" following a 1988 petition from Dr. Wilbur Mayhew and Ms. Barbara Carlson of the University of California at Riverside to the California Fish and Game Commission. The Petition requested State listing of this sensitive reptile as an endangered species. In response to this petition, *The Status of the Flat-Tailed Horned Lizard (Phrynosoma mcallii) in California* (CDFG, 1989) presents findings in support of the revised listing based on life history parameters and factors responsible for the declining status of this species.

## Birds

Ten bird species occurring or utilizing habitats within Imperial County are listed as "Rare" and/or "Endangered" by the USFWS or CDFG. The southern bald eagle is listed as "Endangered" by the USFWS and CDFG; the American peregrin falcon is listed as "Endangered" by the USFWS and CDFG; the elf owl is listed as "Endangered" by the CDFG; the California brown pelican is listed as "Endangered" by the USFWS and CDFG; the Aleutian Canada goose is listed as "Endangered" by the USFWS; the Yuma clapper rail is listed as "Threatened" by the CDFG and "Endangered" by the USFWS; the California least tern is listed as "Endangered" by the USFWS and CDFG; the western yellow-billed cuckoo is listed as "Endangered" by the CDFG; the Arizona Bell's vireo is listed as "Endangered" by the CDFG; and the least Bell's vireo is listed as "Endangered" by the USFWS and CDFG.

Several other bird species are listed as "Threatened" by the CDFG, including Swainson's hawk, greater sandhill crane, California black rail, and bank swallow. The California black rail is also a Category 1 candidate for the federal "Endangered" species list, and the tri-color blackbird is currently proposed for federal listing as either threatened or endangered. Agricultural areas in the County provide



important habitat for species such as the sandhill crane, which utilizes wetland roosting areas between Brawley and Imperial (including portions of the Mesquite Lake SPA) and forages throughout the Valley.

The following raptors seen soaring over various habitats throughout Imperial County are considered sensitive due to an overall regional loss of foraging and nesting areas within southern California: golden eagle, prairie falcon, Cooper's hawk, sharp-shinned hawk, ferruginous hawk, Harris' hawk, osprey, northern harrier, American kestrel, turkey vulture, killdeer, long- and short-eared owl, and burrowing owl. Also, as primary carnivores, they are often more susceptible to changes in their environment. Twenty-four key raptor areas are managed by BLM on lands under its authority throughout the State.

## **Mammals**

Mammalian species of high interest occurring in Imperial County include the American badger, desert kit fox, Yuma mountain lion, and bighorn sheep. The peninsular bighorn sheep is currently proposed for listing by the CDFG as a "Threatened" species. None of these species, however, are listed as "Rare" or "Endangered" by either the USFWS or CDFG. Several species of bats are listed as "Species of Special Concern" by the CDFG, including the California leaf-nosed, Townsend's western big-eared, and California mastiff bats. These species and the pallid and spotted bats are also Category 2 candidates for the federal "Endangered" species list. Agricultural areas in the County provide foraging habitat for bats, which are attracted to fruit, fruit flies and drainage canals.

## **Habitats**

Sensitive habitats are those which are considered rare within the region or support sensitive plants or animals. Habitat values in the County vary due to differing levels of disturbance. Past disturbances from agricultural and recreational activities are the primary sources for reduced habitat values. Sensitive habitats of the County include desert riparian, fresh emergent wetlands (freshwater marsh), palm oases, and desert succulent shrub, and sand dunes. Although not considered sensitive, agricultural and other disturbed areas are often of significant value to certain animal species such as large mammals (e.g., foxes, coyotes and badgers), birds (e.g., sandhill crane), and raptors (e.g., burrowing owl) because they provide foraging opportunities.

In southern California, wetlands by their nature are limited, and in Imperial County they are extremely limited. They are also one of the fastest disappearing habitats in the State. Proximity to water, interface between a variety of habitat types, and vertical stratification of foliage are factors which contribute to the richness and productivity of wetlands. While a few wildlife species are restricted entirely to wetlands for all of their life requirements, many more are dependent on them for necessities such as food, cover, or breeding. Numerous other species also make extensive use of these habitats even though they may not be entirely dependent upon them. Due to their limited area and diminishing acreages, the occurrence of sensitive plants, and the ability to support a diversity of wildlife species, desert riparian and freshwater marsh habitats are considered sensitive in Imperial County.

Palm oases are sensitive due to their limited distribution and high wildlife diversity. Because they rely on permanent sources of water, these habitats are restricted to areas of moist alkaline soils near seeps,





springs and streams around the Salton Sea basin. Desert succulent shrub habitats are sensitive due to the predominance of sensitive cactus species, such as foxtail cactus, crucifixion thorns, Munz's cholla, Wiggins' cholla, and giant Spanish-needle.

As mentioned, the sand dunes of south-central Imperial County contain many examples of rare and/or endangered plants, insects and animals that have adapted to the extreme arid conditions. These species include the Pierson's milk-vetch, Wiggins' croton, Algodones Dunes sunflower, Andrews' dune scarab beetle, and flat-tailed horned lizard.

Other important habitat areas in Imperial County include the Salton Sea, Colorado River, agricultural-related canals and drains, mesquite hummocks, and desert washes. These diverse and occasionally highly specialized communities constitute an important and valuable resource which will require protection if their long-term value is to be preserved.

### **C. Cultural Resources**

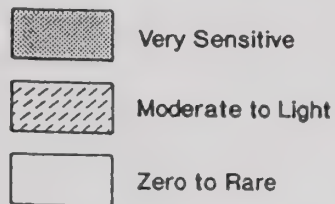
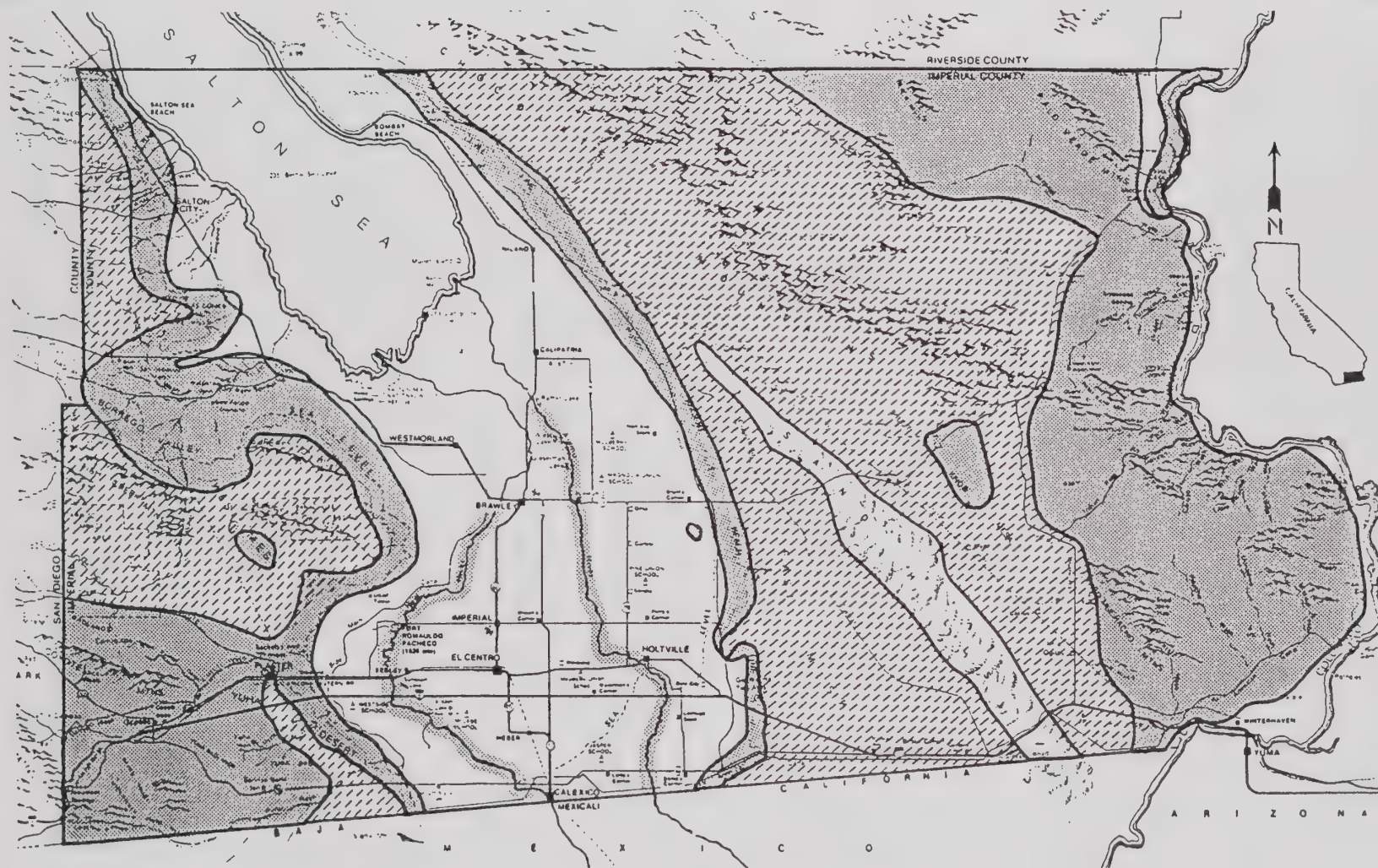
In Imperial County most archeological work can be separated into two distinct sections: prehistoric and historic. All prehistoric archeology deals with aboriginal culture and systems which existed prior to Spanish colonization in 1769. Historical archeology deals with uncovering facts that no known historical documentation has provided.

#### **1. Prehistoric Resources**

Approximately 7,000 prehistoric archaeological sites have been recorded in Imperial County (Jay von Werlhof, personal communication). A wide variety of site types are represented including settlements, trails, rock art, geoglyphs, fish traps, and resource procurement and manufacturing locations. The current distribution and availability of such resources are a consequence of several environmental and historic factors. Environmental factors include the periodic flooding of ancient Lake Cahuilla and the existence of the New River and Alamo River, all of which encouraged prehistoric settlement and resource use in the vicinity of their shorelines and riverbanks. At the other extreme, an environmental feature that discourages the likelihood of finding prehistoric cultural resources is the Algodones Sand Dunes. From a historical standpoint, the intensive use of Imperial Valley for irrigation agriculture since the beginning of this century has impacted any resources that may have existed on land that is now farmland or under the Salton Sea.

A sensitivity map, prepared by Mr. Jay von Werlhof of Imperial Valley College for this Element, illustrates general areas that are very sensitive or moderately sensitive, and those areas not expected to contain prehistoric resources (Figure 4). As indicated in Figure 4, few highly sensitive resources exist within the major populated and developed portions of the County, and this is precisely the area that has been intensively farmed. The important exceptions in this area include the New River and the Alamo River which, as described above, were extensively utilized by the Kamia as late as the mid-1800s. Irrigation agriculture has also impacted sensitive resources that presumably existed near the community of Palo Verde.





0 6 12 miles



Imperial County  
General Plan

Sensitivity Map for Cultural Resources

Conservation and Open Space Element

Figure  
4





Other areas that are highly sensitive include the vicinities of the west and east Lake Cahuilla shorelines, lower Borrego Valley extending east to Highway 86, the southwesternmost portion of the County centered around Ocotillo, a portion of the Pilot Knob Mesa area east of Glamis, and the entire easternmost portion of the County including the Palo Verde Mountains and the area between Ogilby Road and the Colorado River. The only non-agricultural areas that are expected not to contain resources are the immediate east and west sides of the Salton Sea, and the Algodones Sand Dunes.

Areas that are moderately to lightly sensitive include most of the Chocolate Mountains and portions of East Mesa, West Mesa, the Fish Creek Mountains, and the Superstition Mountains. The lack of water and relative harsh terrain combined to discourage major use of these regions. However, significant resources have been found in these areas and additional archaeological research will undoubtedly lead to the discovery of others.

## 2. Historic Resources

Approximately 200 historic sites have been recorded in Imperial County (Jay von Werlhof, personal communication). Important historic resources date back to 1540, when the Hernando de Alarcon Expedition discovered Alta California from near the intersection of Interstate 8 and Highway 186 on the Colorado River (California Registered Historical Landmark No. 568). The next major historical event occurred in 1775 when Juan Bautista de Anza first passed through the area. The Anza Trail itself constitutes a significant cultural resource in the Yuha Desert, as does the later Sonoran/Southern Emigrant Trail which served as a major route to and from coastal California from 1825 to 1865. Although very few structures or artifacts may remain from the use of these trails, the routes themselves are of historical significance. As described in the *Current Land Use Plan for Yuha Desert Planning Area* (adopted March 20, 1973 by the Imperial County Board of Supervisors), the corridor of historic trails joining the Yuha Desert with, and passing through, the Anza-Borrego Desert State Park, represents an area "of such a nature as to be of State or National importance" (p. 4). Several historical markers have been established along the Anza Trail, including the monument of Los Puertecitos (California Registered Historical Landmark No. 635) near Highway 78 and Kane Springs Road.

Two additional significant resources that stem from the Spanish period (1769-1821) are the La Purisima Conception Mission site (California Registered Historical Landmark No. 350), located at Mission St. Thomas on Indian Hill, and the San Pedro Y San Pablo de Bicuier Mission site (California Registered Historical Landmark No. 921), located near Laguna Dam. The former was constructed in 1780 at the request of the local Indians, and the latter in January 1781 as a strategic settlement for those crossing the Colorado River. Both were attacked and destroyed on July 17, 1781 by the Quechans.

One of the few known historic sites from the Mexican period (1821-1848) is Fort Romualdo Pacheco (California Registered Historical Landmark No. 944). Located about seven miles west of Imperial near the New River, this fort was the only Mexican fort in Alta California, and was constructed to help maintain the Sonoran Trail. It was constructed in 1825 and attacked by the Kamia on April 26, 1826, resulting in the deaths of three soldiers and the fort's abandonment. Adobe walls about two and a half feet high remained in 1968 but were leveled for agricultural purposes shortly thereafter. The site was excavated by Jay von Werlhof of Imperial Valley College in 1978.



Few sites remain from the early American period (1848 through the early 1900s), since little settlement and other use occurred until the availability of irrigation water in 1901. Most sites have been impacted by agricultural activities and the construction of towns. One American period site has received a historical monument for being the location where the first irrigation water entered the County. This monument is located a few feet from the U.S.-Mexican border on Barbara Worth Road, between Calexico and the Alamo River.

Another significant historic site is the Plank Road near I-15 along the Algodones Sand Dunes. Utilized from 1914 to 1927, this seven-mile long road has been dedicated as California Registered Historical Landmark No. 845. Other sites of local historical importance are described in *Imperial Valley Historical Markers* (Little 1982). In addition, plat maps of the early 1900s indicate numerous structures throughout Imperial Valley. Although many of these structures are no longer standing, there is a potential for the existence of subsurface features such as house foundations, privies, and trash deposits at these locations. Information from these sites could contribute to an understanding of early settlement in the County.

Locations of contemporary Native American importance include the Quechan Reservation in southeastern Imperial County and a portion of the Torres-Martinez Reservation in northwestern Imperial County.

#### D. Soils

The soils of Imperial Valley consist of silty clays, silty clay loams, and clay loams that have formed on nearly level old lakebeds and floodplain deposits. The soils are generally deep, highly calcareous, and usually contain gypsum and soluble salts. The central part of the County, which is irrigated, generally has fine textured silts. Sandy soils predominate in higher areas, such as the East and West Mesas, and are typical of most of the deserts in the southwestern United States. These soils do not have well defined horizons and are several thousand feet deep.

The federal Soil Conservation Service Soil Survey identifies ten major soil associations. The ten associations can be grouped by landscape:

East and West Mesas - There are four soil associations that dominate the East and West Mesas: Rositas, Rositas-Superstition, Antho-Superstition-Rositas, and Holtville-Antho. The topography of the East and West Mesas is nearly level to moderately steep. Soils on the East and West Mesas are generally well to excessively well drained. These soils are generally used for desert recreation or wildlife habitat. The soils tend to be unsuited for agriculture with the exception of a few areas of Rositas soils.

Lacustrine Basin - There are six soil associations that dominate the lacustrine basin: Imperial, Imperial-Holtville-Glenbar, Meloland-Vint-Indio, Niland-Imperial, Glenbar-Imperial, and Fluvaguents. The topography of the lacustrine basin is nearly level. Soils in the lacustrine basin are generally well drained to poorly drained soils. Soils in the basin are mainly used for crop production through irrigation and constitute over sixty percent of Imperial County.





The primary conservation issue related to soils is salt accumulation. Salt accumulation in Imperial County is primarily the result of the high concentration of dissolved salt in irrigation water and the prominent clay component of the soils. Agricultural production is affected by salt accumulation in the soil. Specific crops vary in their sensitivity to salinity. The yield of some crops only declines by a few percentage points while other crops may totally fail in saline conditions.

## **E. Minerals**

A wide variety of minerals are found throughout Imperial County. Gold, gypsum, sand, gravel, lime, clay, and stone have the highest economic value and are presently extracted for profit in the County.

Industrial materials are also readily available, including kyanite, mineral fillers (clay, limestone, sericite, mica, and tuff), salt, potash, calcium chloride, manganese, and sand. The managed use of the valuable mineral deposits is important for regional economic stability. It is also important to insure that adequate deposits remain for future generations.

Two general issues surround the extraction of minerals in Imperial County: land use conflicts and environmental impacts. The geographic extent of mineral resources is a function of geologic factors.

As a result, mining operations are restricted to the relatively few locations where mineral deposits are suitable for extraction. Figure 5 depicts mining areas within the County. When these sites or the adjacent areas are developed, the imposition of mining operations often conflicts with the developed land uses. Extractive operations are particularly unwanted as neighbors by residential or commercial land uses. If mineral deposits are to be protected for managed use, the location, extent, and quality of deposits must be determined and land use plans must minimize development on and around valuable deposit sites.

Mineral extraction operations can have significant impacts on environmental resources. Extractive operations can degrade air quality, generate noise, accentuate geologic hazards, pollute surface and groundwater, jeopardize public health and safety, destroy valuable cultural resources, alter the visual landscape, and impact sensitive wildlife and plant species. The Surface Mining and Reclamation Act (SMARA) requires mitigation of potentially adverse environmental impacts while insuring the continued supply of mineral resources for society.

## **F. Energy**

Energy is an essential component of all economic activity. Yet the majority of energy produced and utilized is harmful to the environment to some degree. Increasing public concern about the societal costs of pollution have focused government and industry attention on the connections between energy and the environment. Energy resources include fossil fuels (oil, gas, natural gas, petroleum, coal, etc.), the hydraulic force of water, geothermal fluids, nuclear energy, wind, biomass and solar energy, among others. Energy resources in Imperial County consist of the hydraulic force of water, geothermal fluids, and biomass. Geothermal supplies are not discussed here, because the subject is presented in a separate General Plan Element, the Geothermal and Transmission Element.









In 1936, the Imperial Irrigation District (IID) entered into the electrical power business as a public utility. Prior to this, electric energy was accessible only to Imperial Valley residents who lived in the urban areas, at a very high rate. After construction of the All-American Canal, low cost hydroelectric energy became a by-product of the irrigation system available to Imperial Valley. As electrical needs have increased, IID has imported additional sources of energy to supplement the hydro-generated power.

For many years, the average consumption by residential customers of IID has been the highest in the southwest, and about thirty percent higher than the national average. The average residential customer uses 13,374 kilowatt-hours (kwh) annually, while the nationwide average is 9,229 kilowatt-hours (kwh) (1987). Much of this is due to the high use of air conditioning. IID serves most of Imperial County, except in the Palo Verde area where power is supplied by Southern California Edison (SCE). Imperial Irrigation District also supplies electricity to parts of San Diego County and Riverside County including the Coachella area.

IID operates nine hydroelectric generation plants, a 180-megawatt steam plant, eight gas turbines and an eight-unit diesel plant. The Coachella Valley Substation, placed in service in June 1986, is the key link between the IID and Southern California Edison. A 230-kV transmission line constructed in 1988 allows Imperial Valley access to the rest of the southwestern power grid, and establishes a strong path to export geothermal and other alternative energy (such as biomass purchased by SCE) from Imperial Valley.

The majority of urban air pollution is due to combustion of fossil fuels, particularly oil used in transportation. In addition, oil is a cause of concern about future energy prices and the security of the energy supply. Most of the oil in the United States is used in transportation. In California, three-quarters of the oil is used for transportation. We must cut our dependency on oil by producing energy with alternatives to fossil fuels. The greatest opportunities for substituting cleaner fuels for oil in the near future exist with natural gas.

There are no known available fossil fuel reserves in Imperial County. IID imports these fuels for use at the El Centro Steam Plant, the Brawley Diesel Plant, Rockwood Plant and Coachella Station. In 1988, approximately sixty-two percent of electricity generated by the Imperial Irrigation District was with the use of imported fossil fuels.

Power generated by the hydraulic force of water is a relatively low cost means of generating electrical power with minimal adverse impacts on the environment when the resource is available. In normal rainfall years, nearly sixteen percent of California's electrical generating capacity comes from hydropower.

The first hydroelectric plants on the All-American Canal were completed at Drops 3 and 4, in 1941. The hydroelectric facility at Drop 2 was installed in 1953. The Pilot Knob Plant was built on a bypass channel between the All-American Canal and the Colorado River, and went into operation in 1957. The Drop 5 installation was completed in 1982, the Drop 1 and East Highline Turbom Hydro Plants were opened in 1984.



Imperial County has to date approved development of two power plants to generate 33 MW (gross) of electricity with use of agricultural waste products. The plants are located together north of the City of Imperial in an area of the County designated for heavy industrial uses, on the west side of Highway 111, south of Keystone Road.

Mesquite Lake Resource Recovery Project is the world's first commercial-scale power plant to use cattle manure as fuel, designed to produce 15 MW. The County issued a Conditional Use Permit for the project on July 3, 1985. The plant came on line in mid-July 1989.

Environmentally, the plant provides several benefits to the County. It generates as much power as would be derived from the burning of 350,000 barrels of oil each year, thereby reducing fossil fuel consumption. The project will use approximately 260,000 tons of cattle manure each year, about half of the amount produced by cattle feedlots in the Imperial Valley. The plant converts a waste disposal problem into a natural fertilizer from the ash formed in the combustion process. The ash is free of insects, bacteria and weed seeds. The company is investigating alternative uses for the ash such as paving material, hazardous waste binder, landfill cover soil amendment, and geothermal brine binder.

The second plant, Imperial Resource Recovery Project, was approved to use a combination of wood waste, manure, and crop residues (wheat, straw, cotton stocks and Bermuda Grass Straw). This plant should contribute to a slight decrease in overall local air quality, since much of these wastes are now being burned in open fields. The plant capacity is 15.35 megawatts (net), and in full operation will produce 117 million kilowatt hours/year for sale to SCE, transmitted by the 230 kilovolt transmission line from Heber to Coachella. The waste fuel is burned to create hot flue gas from which heat is recovered to generate steam in a waste heat boiler.

An extensive source of energy is available in Imperial County in the form of sunlight or solar. Photovoltaic cells power a variety of items from calculators to remote telecommunications stations and water pumps. It has been estimated that solar power could eventually produce ten percent of the United States energy supply. No commercial power generation of solar energy presently exists in the County.

## **G. Regional Aesthetics**

Imperial County contains a wealth of scenic visual resources. These visual resources include desert areas, sand hills, mountains, and the Salton Sea.

The desert areas include the Yuha Desert, the West Mesa, lower Borrego Valley, East Mesa, and Pilot Knob Mesa. The Yuha Desert is located in the southwest portion of the County and can be viewed from Interstate 8. The Yuha Desert contains unique geologic features including sand chimneys and painted gorge formations. These features add beauty to this natural landscape. The barren landscape contrasts starkly against the backdrop of mountains. Other scenic deserts include the West Mesa area, which is bordered on the east by the Algodones Sand Dunes, the lower Borrego Valley, the East Mesa and Pilot Knob Mesa.

The Algodones Sand Dunes cover approximately 160 square miles stretching about 40 miles in width. They extend lengthwise in a northwest by southeast direction, and are situated between East Mesa and Pilot Knob Mesa. Consisting of shifting sands, the dunes attain a thickness of at least 200 feet in their





central parts. The dunes played a major role in early exploration, travel, and development in Imperial County. They are currently bisected east/west by Highway 78 between Brawley and Glamis, and by Interstate 8 between El Centro and Yuma. These dunes represent a unique visual resource of Imperial County.

Mountains make up another significant visual resource of Imperial County. On the west side of the County are the eastern foothills of the Peninsular Range. These foothills include the In-Ko-Pah or Jacumba Mountains, the Coyote Mountains, the Fish Creek Mountains, and in the northwesternmost corner, the Santa Rosa Mountains.

The Chocolate Mountains, so named because of their dark color, are located in the northeastern portion of the County, stretching northwest by southeast between Riverside County and the Colorado River. They are bisected by Highway 78 between Glamis and the Palo Verde area. These mountains reach an elevation of 2700 feet, and are highly visible from throughout the County. They are extremely rugged, virtually undeveloped, and used as a Naval Gunnery Range.

Prominent landmarks visible from much of Imperial County are the Superstition mountains and Superstition Hills located in the west Mesa area, southeast of lower Borrego Valley and west of Westmorland and Brawley. These are clearly visible looking north from Interstate 8, west of El Centro, and from Highway 86 between El Centro and the Salton Sea. Perhaps the most significant landmark in the County is Mount Signal, located along the International Border on the eastern edge of the Yuha Desert, west of Calexico. This feature is visible from the entire Imperial Valley.

The Picacho State Recreation Area contains some prominent visual resources as well. Unique scenic values are created by volcanic formations and El Picacho itself, rising several hundred feet from the valley floor.

## **H. Air Quality**

Clean air is a valuable and essential resource which affects many aspects of our daily lives. It is vital to our health and welfare, to the local agricultural economy, and to the quality of life enjoyed by Imperial County residents. The capacity of the air to absorb environmental contaminants is limited however, and must be managed wisely to avoid significant deterioration of the resource.

### **1. Climatic Conditions**

The Imperial Valley experiences clear skies, very low humidities, extremely hot summers, mild winters, and little rainfall. These climatic conditions are strongly influenced by the large-scale sinking and warming of air in the semi-permanent subtropical high pressure center of the Pacific Ocean. The high pressure ridge blocks out most mid-latitude storms, except in winter when the high is weakest and farthest south. The coastal mountains also have a major influence on climatic conditions by blocking the cool, damp marine air found in the California coastal environs. The flat terrain of the valley and the strong temperature differentials created by intense solar heating produce moderate winds and deep thermal convection.



The combination of subsiding air, protective mountains, and distance from the ocean all combine to severely limit precipitation. Rainfall is highly variable with precipitation from a single heavy storm one year exceeding the entire annual total during a following drought year.

Average humidities range from 28 percent in summer to 52 percent in winter. A large daily oscillation of temperature produces a corresponding large variation in the relative humidity. Nocturnal humidities rise to 50-60 percent, but drop to about 10 percent during the day.

High winds are occasionally experienced in the Imperial Valley. Wind speeds in excess of 31 miles per hour occur most frequently in April and May. On an annual basis, strong winds (greater than 31 miles per hour) are observed 0.6% of the time; speeds of less than 6.8 miles per hour account for more than one-half of the observed winds. The prevailing winds are from the west-northwest through southwest. Secondary flow is observed from the southeast.

## **2. Air Quality Standards**

Over the past several decades, both the state and federal governments have set and periodically revised ambient air quality standards for pollutants that are of greatest public health concern. These standards encompass the most common varieties of airborne materials which can pose a health hazard. Pollutants with ambient standards remain the chief focus of air quality management activities around the nation.

Air quality standards are typically set at levels which provide a reasonable margin of safety and protect the health of the most sensitive individuals in the population.

Pollutants for which ambient standards have been established based on the criteria studies mentioned above are known as 'criteria pollutants'. Criteria pollutants include ozone, carbon monoxide, nitrogen dioxide, sulfur dioxide, PM10 (a general category of airborne particles 10 microns or less in diameter), and lead, a specific particulate pollutant. California has also set standards for sulfates, hydrogen sulfide, vinyl chloride, and visibility-reducing particles. Different standards for these and other pollutants have been set by California and other states. California standards tend to be more restrictive than national standards, and are based on objective health and welfare concerns.

Monitoring of ambient air quality in Imperial County began in 1976. Since that time, monitoring has been performed by the Imperial County Air Pollution Control District (APCD), the Air Resources Board (ARB), and by private industry. Ambient monitoring is typically performed either in locations representative of where people live and work, or near industrial sources to document the air quality impacts of those facilities. As of March, 1991, nine public agency and private sector monitoring stations were in active service in the county.

## **3. Local Pollutant Measurements**

Pollutant levels at any one location vary widely over time. As a result, air monitoring produces highly diverse data. While not always representative of overall existing conditions, the highest levels of pollutants observed at a location are used for evaluating compliance with air quality standards.

State standards for ozone and PM10 are currently exceeded within the Imperial County Air Pollution Control District, and violation of federal standards will occur in future years without adequate planning and air quality management.





Numerous agencies with direct and indirect interest in air quality participate in the planning process. The Environmental Protection Agency (EPA) administers the federal Clean Air Act and other air quality related legislation. The federal Clean Air Act requires EPA to approve state implementation plans. The California State Implementation Plan (SIP) is comprised of plans developed at the regional or local level. Each of these plans is individually reviewed and approved by EPA prior to incorporation into the SIP.

The California Clean Air Act (CCAA), signed into law in September of 1988, requires all areas of the state to achieve and maintain the California ambient air quality standards by the earliest practicable date. These standards are generally more stringent than the federal standards.

The ARB has designated all air pollution control districts as attainment or nonattainment for each state air quality standard. Nonattainment designations are to be further categorized into three levels of severity: "moderate" (can demonstrate attainment by 1994); "serious" (can demonstrate attainment by 1997); and "severe" (cannot demonstrate attainment until sometime after 1997).

Under the CCAA the ARB and the air pollution control districts share primary responsibility for improving air quality. The extent of the planning effort to control air pollution within a district depends upon the severity of the air pollution problems within the district. Although formal severity classifications have not yet been made, Imperial County is expected to fall within the "moderate" attainment category for ozone, and is required to implement the following:

- A permitting program designed to achieve no net increase in emissions of nonattainment pollutants or their precursors from new or modified stationary sources which emit or have the potential to emit 25 tons per year or more of nonattainment pollutants or their precursors (Health and Safety Code 40918(a) (1)).
- Reasonably available transportation control technology for all existing sources (Health and Safety Code 40918(a) (2)).
- Reasonably available transportation control measures (Health and Safety Code 40918(a) (3)).
- Provisions to develop area source and indirect source control programs (Health and Safety Code 40918(a) (4)).
- Provisions to develop and maintain an emissions inventory system to enable analysis and progress reporting and a commitment to develop other analytical techniques to carry out its responsibilities pursuant to Health and Safety Code Section 40924 subdivision (b).
- Provisions for public education programs to promote actions to reduce emissions from transportation and areawide sources (Health and Safety Code 40918(a) (6)).

The 1991 Air Quality Attainment Plan for Imperial, prepared by the Imperial County Air Pollution Control District (April 14, 1992) is designed to meet these requirements. The APCD shares responsibility with ARB for ensuring that all state and federal ambient air quality standards are



achieved and maintained within the County. State law assigns primary responsibility for control of air pollution from stationary sources to local districts, while reserving an oversight role for the ARB. Generally, the districts must meet minimum state and EPA program requirements; in most instances, districts can implement more stringent regulations than EPA or the State require. The District is also responsible for the inspection of stationary sources, monitoring of ambient air quality, and planning activities such as modeling and maintenance of the emission inventory. Districts in state nonattainment areas are also responsible for developing and implementing transportation control measures necessary to achieve the state ambient air quality standards.

## **I. Open Space**

Open space is a valuable resource in any community or county experiencing urbanization. The value of open space to Imperial County includes shaping the overall urban form, providing outdoor opportunities, enhancing and protecting scenic vistas, ensuring public health and safety, preserving valuable natural resources, and providing areas to manage the production of resources.

Open space is considered here in its broadest terms as any parcel or area of land or water which is essentially unimproved and devoted to one or more of the following categories of uses:

- Preservation of Natural Resources
- Managed Production of Resources
- Outdoor Recreation
- Protection of the Public Health and Safety

The Open Space section is intended to provide for the integration of functional open spaces into the land uses identified in the updated Land Use Element. The timely identification and preservation of open space lands is intended to discourage their premature or improper conversion to intensive urban uses. Open space land approved to be utilized for intensive urban uses is irretrievably lost.

Open space areas within Imperial County may be large expanses, long corridors, or small parcels. The state and federal governments also hold large open space areas within the County, the largest being the California Desert Conservation Area, maintained by the Federal Government under the jurisdiction of the Bureau of Land Management. The second largest federal land holding in the County is the U.S. Department of the Navy's Yuma Marine Air Station. The State has certain jurisdiction over open space areas in the Cargo Muchacho Mountains and other areas along the Salton Sea.

Open space corridors generally follow natural features such as stream courses or ridge lines. These linear features are valuable because they emphasize natural resource conservation, natural habitat preservation, scenic vista enhancement, and recreational opportunities.

Likewise, open space may be held in small parcels. These parcels are primarily held by individuals or homeowner associations. These acreages, valuable in their aggregate and scenic recreational attributes, generally do not meet open space size criteria. Open space areas in the program, with a large area or corridor can be publicly or privately owned and maintained. The County owns and maintains large open space areas such as the Wiest Lake Park and Sunbeam Lake Park.





It is assumed that the military holdings within the County will continue for the foreseeable future. The military leases substantial areas of the land from the Bureau of Land Management and agencies for training and experimental operations. Certain areas have been designated as inaccessible to the general public under any conditions. Aerial parachute drops and gunnery and bombing practice sites constitute a threat to the public health and safety in these areas. Additional areas are restricted for security reasons. Portions of the military lands may be open to the public, such as for Off-road Vehicle (ORV) use, on a controlled and restricted basis, with the military retaining the right to deny or cancel recreational uses when emergency or priority operations are necessary. The County has no regulatory authority over these lands, and if controlled recreational use is permitted, it will be subject to the management procedures imposed by the Bureau of Land Management.

## **1. Open Space for the Preservation of Natural Resources**

The Preservation of Natural Resources section, includes but is not limited to:

- areas required for the preservation of plant and animal life including habitat for fish and wildlife species;
- areas required for ecologic and other scientific study purposes;
- rivers, streams, bays, and estuaries; and
- coastal beaches, lakeshores, banks of rivers and streams, and watershed lands.

Imperial Valley possesses some of the most unique natural habitats, geologic formations, and archaeological sites in the southwest. The value of these resources has in certain instances been recognized. The dependence of plants and animals on the preservation of unique habitat areas illustrates the fragile ecological balance that has developed in the desert. Interruption of this ecological system endangers the existence of irreplaceable natural resources. The costs of interaction are becoming increasingly apparent. Loss of marshland habitat and the available food supply have reduced waterfowl numbers; archaeological sites are damaged; and even the rare giant Intaglio in the Yuha Desert area is being thoughtlessly destroyed.

### **Protected Areas - National Wildlife Refuges**

Most of the protected areas are under the authority and management of State or Federal Agencies. The existence of open space lands included in these areas is assumed to continue.

Located near the southern end of the Salton Sea, the Salton Sea National Wildlife Refuge provides winter habitat for migratory waterfowl along the Pacific Flyway. Numerous rare and endangered species, as well as resident waterfowl, utilize the area, providing opportunity for birdwatching and photography. Originally, the refuge consisted of approximately 36,526 acres, however, all but about 2,200 acres are submerged.

Situated along the Colorado River in the Lower Colorado Valley, the Imperial National Wildlife Refuge covers approximately 25,765 acres. The portion of land in Imperial County is about 7,958



acres, all of which has been preserved as natural habitat. The refuge serves migratory waterfowl of the Pacific and Central Flyways, notably Canadian Geese. It provides protected habitat for many endangered animal types. These include the bighorn sheep, burro deer, Yuma mountain lion, Yuma clapper rail, and several species of migratory waterfowl. The narrow dense growth of marsh and brush vegetation along the river supports abundant small animal life. The refuge is open to the public and a visitor center is open Monday through Friday. Recreational use is primarily associated with boating and water activities to the south on the Arizona side. Red Cloud Road serves the area with five lookouts, and a one mile hiking trail is open to the public. Seasonal hunting is also permitted.

Located along the Colorado River adjacent and directly north of Imperial National Wildlife Refuge, only a small portion of the Cibola National Wildlife Refuge is located in Imperial County. Primarily riverine, it protects much of the same wildlife types as the nearby Imperial National Wildlife Refuge. The area is open for limited seasonal hunting and recreational use primarily on the north end, or Arizona side.

### **Protected Areas - State Wildlife Management Areas**

The California Department of Fish and Game manages two Wildlife Areas in Imperial County. Both areas provide habitat for migratory waterfowl and reduce depredation of surrounding croplands.

Located near the southern end of the Salton Sea, the Imperial Wildlife Management Area is predominantly low lying marshland serving the purpose of reducing crop depredation and open for seasonal hunting. The area consists of two sites:

Finney - Ramer Unit. This unit consists of 2,047 acres preserved in natural habitat. It was originally established as a duck refuge. Four lakes are included in this unit. The lakes are: Lower Ramer Lake, 160 acres; Upper Ramer Lake, 62 acres; Lower Finney Lake, 84 acres; and Upper Finney Lake, 20 acres. The area was originally purchased and developed by the Bureau of Reclamation as a mitigation measure in the development of the Coachella Canal.

Wister Unit. This unit consists of 5,243 acres and 2,000 acres leased from the Imperial Irrigation District, which is preserved in natural habitat and supplemented with grains such as wheat, milo, barley, rye and grass.

The Hazard Unit consists of 535 acres leased to the U.S. Fish and Wildlife Service, and is managed along with the Salton Sea National Wildlife Refuge.

The Julian Wash Wildlife Management area consists of 485 acres, adjacent to the Colorado River, preserved in natural habitat. It provides sanctuary to many of the same plant and animal species as the nearby Imperial National Wildlife Refuge.

Located generally between the eastern edge of the Imperial Valley agricultural region and the Southern Pacific Railroad, lie the Algodones Sand Dunes. These sand dunes are the most extensive in California, rising to heights of over 300 feet above the surrounding desert floor. This dune system extends more than forty miles in length, in a band averaging five miles in width and provides excellent educational and recreational opportunities. Formed by the windblown beach sands of ancient Lake





Cahuilla, the dunes are habitat for a range of rare plants and animals, picturesque scenery and playgrounds for Off-Road Vehicles. In order to preserve a portion of the dunes in an undisturbed state and to protect sensitive plant and animal species, the Bureau of Land Management established the Algodones Outstanding Natural Area in the dunes immediately north of State Highway 78. The same areas have been designated a National Natural Landmark by the National Park Service. The dunes are under Bureau of Land Management jurisdiction and their California Conservation Desert Plan uses an integrated approach to management policies which considers the total natural resource base.

Off-road vehicle activity is permitted on more than eighty percent of the sand dunes, or over 142,000 acres. The three primary areas are Mammoth Wash (located at the north end of the dunes), Glamis Gecko (located just south of State Highway 78), and Buttercup Valley (located just south of Interstate 8 near the Mexican Border).

Organized, competitive or commercial off-road vehicle events such as sand drags, closed-course racing and hill climbs, are sometimes conducted in the dunes under a Special Recreation Use Permit from the Bureau of Land Management.

San Sebastian Marsh is a unique, water based habitat along San Felipe Creek has supplied a permanent, dependable source of water for people and wildlife since ancient times. The marsh, home to a variety of plants and animals, is the only designated critical habitat in California for an endangered species, the desert pupfish.

Because of its importance in sustaining this unique marshland environment, San Felipe Creek is a registered National Natural Landmark. The Bureau of Land Management has designated the San Sebastian Marsh as an Area of Critical Environmental Concern (ACEC).

One of Imperial County's most significant natural areas is the Yuha Desert. Its value as an area rich in archaeological, paleontological, and botanical information has been long recognized. Despite its barren appearance, the Yuha Desert today is home to many animal and plant species, specially adapted to its harsh environment. The Bureau of Land Management designated 40,622 acres of the Yuha Basin as an Area of Critical Environmental Concern in 1980. The Bureau of Land Management has sought to develop a management program which will protect sensitive natural and cultural resources, while providing for a range of uses from sand and gravel mining to recreational use.

Water bodies or flowing rivers or streams are usually important recreational and aesthetic resources, particularly in the arid southwest. The New and Alamo Rivers are presently unsuitable for water contact recreation and serve to transport irrigation drainage to the Salton Sea.

The Colorado River and Salton Sea are water resources which are of regional importance. The Colorado River and Salton Sea possess productive fisheries and other water oriented developments and recreation related opportunities. The salinity of the Salton Sea has risen significantly in recent years, and threatens the continued existence of the fishery. If adequate measures are not taken to halt or reverse this process, it may not sustain the fishery in the near future. The character of the Lower Colorado River has also been radically altered by the regulation of its flow for flood control, hydroelectric development, and other diversionary purposes.



## 2. Open Space for the Managed Production of Resources

The Managed Production of Resources includes but is not limited to:

- forest lands, range land, agricultural lands, and areas of economic importance for the production of food or fiber;
- areas required for recharge of ground water basins;
- bays, estuaries, marshes, rivers and streams, which are important for the management of commercial fisheries; and
- areas containing major mineral deposits, including those in short supply.

Imperial County, while not experiencing the rapid urban development characteristics of the coastal counties, is slowly losing prime agricultural lands to rural subdivisions and annexations to cities for urban uses. Agricultural Land Resources are depicted on Figure 6. Recognition of the importance of preserving this nonrenewable resource has prompted the development of certain goals and objectives.

The utilization of mineral and quarry resources, while not of such critical concern, does warrant attention for the purpose of assuring their continued use.

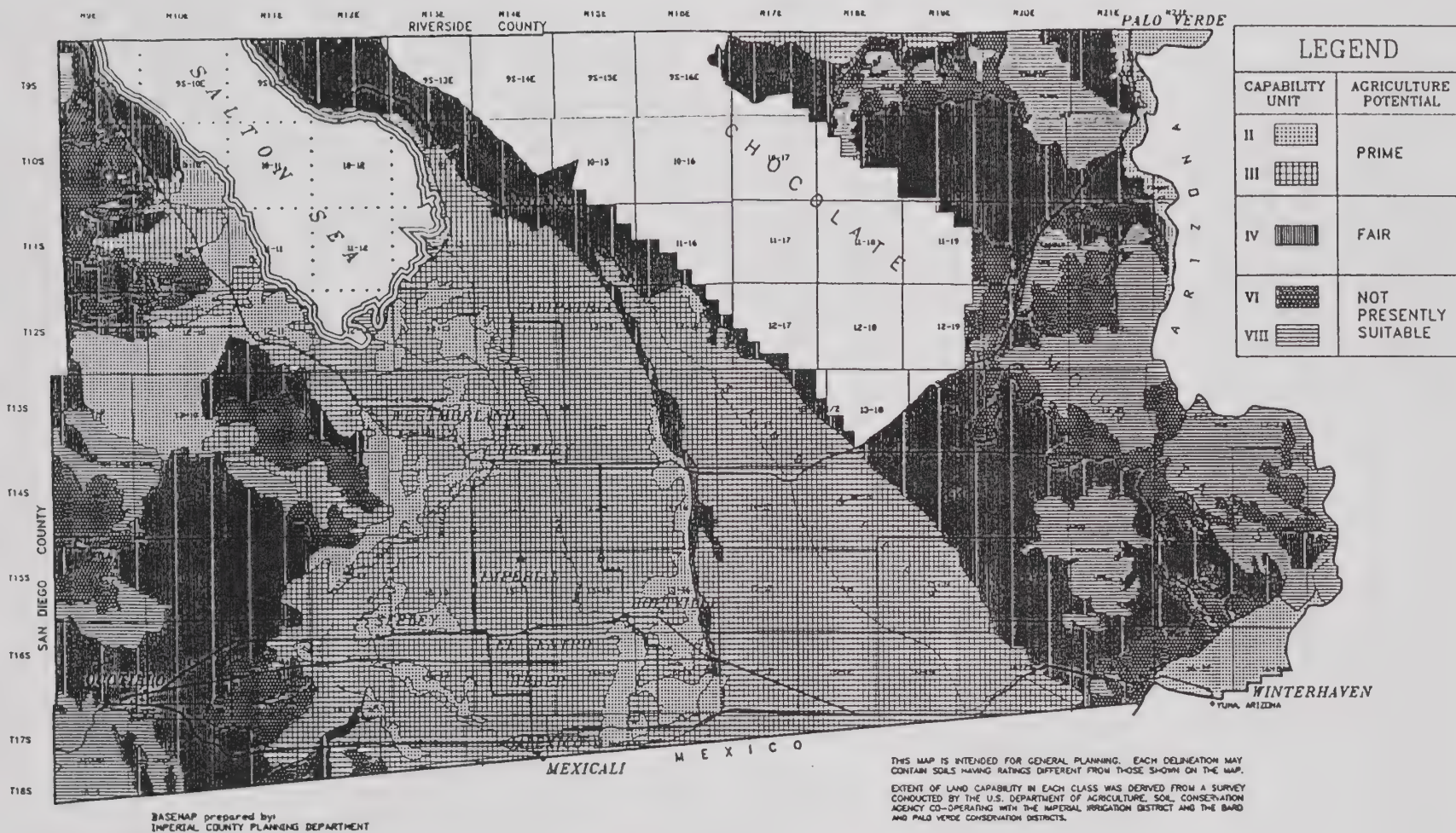
Climate and topographical features impose certain restraints upon the type of land suitable for cultivation in Imperial County. There are approximately 740,000 acres of land suitable for intensive irrigation farming, however, at the present time approximately 450,000 acres are irrigated. The potential irrigatable lands present a valuable future resource which should be protected.

Obviously, not all land is suitable or desirable for agricultural uses. To determine the location and extent of agricultural lands, lands have been mapped and classified according to their agricultural capability (see the Agricultural Element for further information on these lands).

The preservation of prime agricultural lands is beneficial to the public at large and adopted policies should encourage this end. The identification and preservation of prime agricultural farmland, based upon soil characteristics, crop types, and water supply should provide the foundation for a rational and defensible preservation program.







SOURCE: Department of Conservation  
Soil Conservation Service

0 6 12 miles



Imperial County  
General Plan

Agricultural Land Resources

Conservation and Open Space Element

Figure  
6



Imperial County is situated over an area possessing extensive geothermal resources. Imperial County encourages the exploration and development of geothermal resources. The Geothermal Overlay Zone permits geothermal development and production of electrical energy in all areas to which it is applied. For more information, please see the Geothermal and Transmission Element of the General Plan.

Extractive lands are primarily open and are used to withdraw natural resources from the earth such as minerals, sand and gravel, and clay. Extractive operations, though open, are often unsightly when viewed from a public right-of-way. The adoption of development and performance standards for the purpose of minimizing negative environmental impact is necessary.

The State of California (Caltrans) and the County Department of Public Works utilize several sand and gravel quarry sites throughout the area, essentially in unpopulated locations. The continued use of these sites is recognized. The sites indicated are not to be considered exclusive. Additional sites and areas may be utilized for extractive purposes providing such use is consistent with the provisions of the Imperial County General Plan and regulatory devices adopted to implement it. Unless specifically stated, the identification of mineral resources in a particular area does not necessarily require that extraction be permitted, however their presence should be considered if conflicting land uses are proposed.

### **3. Open Space for Outdoor Recreation**

Outdoor Recreation, includes, but is not limited to:

- areas of outstanding scenic, aesthetic, historic and cultural values;
- areas particularly suited for park and recreation purposes; including access to lakeshores, beaches, rivers, and streams; and
- areas which serve as links between major recreation and open space reservations, including utility easements, banks of rivers and streams, trails and scenic highway corridors.

Californians are a recreation minded people; and their mobility requires that recreational requirements be viewed from a regional perspective. This is the result of favorable climate, varied natural recreation opportunities, increased incomes, and more leisure time. Imperial County's sand dunes, deserts, the Salton Sea, the Colorado River, and sunny climate attract an ever increasing number of users from within the County and the nearby metropolitan areas. The New River and the Alamo River serve as potential resources for water activities, but in their present state would jeopardize public health and safety.

Natural resources are the primary determinants of outdoor recreation. Included are climate, geologic character of the land, water features, flora, and fauna. These characteristics are supplemented by significant historic and cultural factors. The extent of the natural resources available, or the historic or cultural value placed upon a specified area will determine the location and degree of recreational development.







A significant portion of Imperial County is held by the Federal Government and controlled by the Bureau of Land Management. The Department of Interior's Lower Colorado River Land Use Plan attempts to provide for future recreation demand while preserving and protecting wildlife, plant life, and unique geological formations along the river. The plan is a program for long range development formulated jointly by Federal, State, and local government agencies. It does not establish definite commitments to be implemented at the present time.

Many open space areas that are home to valuable natural resources also provide recreation areas. Included in this category are the Algodones Sand Dunes and the Wildlife Refuges that have been discussed in the previous section.

Some military lands are suitable for recreational uses during non-operational hours. Subject to Navy and Bureau of Land Management approval, the County encourages these to be open to the public on designated weekends and during specific hours.

Located along a seven mile stretch of the Colorado River, the Picacho State Recreation Area provides natural riverine habitat for many of the same plant and animal species as Imperial National Wildlife Refuge. Unique scenic values are created by volcanic formations and El Picacho itself, rising several hundred feet from the valley floor. The State of California is considering designating the area as part of the State Park System.

A small portion of the Anza-Borrego State Park is located in Imperial County, including the Carrizo Impact Area. The Carrizo Impact Area is not open to public use as decontamination of all active ordnance cannot be guaranteed. The remaining park area provides unique geologic formations, as well as habitat for Nelson - Peninsula bighorn sheep. The California Department of Parks and Recreation is considering expansion of the park.

The Salton Sea State Recreation Area is located along fifteen miles of the northeastern shoreline of the Salton Sea. It provides water oriented recreation, picnicking, camping, and wildlife opportunities, as well as access to the Salton Sea fishery. Many of the recreational facilities provided in the Salton Sea area are privately owned and developed.

Imperial County provides parks and recreational facilities intended to serve as wide a range of interests as possible. Emphasis is placed upon family oriented opportunities, as well as those that encourage visitor use. County recreation facilities include:

Sunbeam Lake  
Red Hill Marina  
Niland Marina  
Heber Beach Sand Dunes

Wiest Lake  
Palo Verde Marina  
Walker Roadside Park

The provision of adequate recreation facilities to meet increased demand is handicapped by the limited financial capacity of Imperial County. Their use by a large non-resident population illustrates the regional importance of these desert recreation resources.



The Imperial Irrigation District operates the system of canals that supply domestic and irrigation water to the County. Certain of the irrigation canals possess significant potential for recreational uses including fishing, picnicking, bicycle and/or equestrian paths in areas near or adjacent to urban areas.

If the problems of vandalism and liability could be overcome, the Imperial Irrigation District canal system could provide prime recreational sites at specified locations within the County. Joint development of these facilities would concentrate the uses and reduce the unauthorized fishing that presently takes place.

Utility corridors present both opportunities and problems to the protection of open space. High voltage transmission lines are very evident in arid areas, and often seriously distract from views of the landscape. Measures must be taken to mitigate this negative impact.

#### **4. Open Space for the Protection of Public Health and Safety**

Public Health and Safety includes but is not limited to:

- areas which require special management or regulations because of hazardous or special conditions such as earthquake fault zones, unstable soil areas, floodplains, watersheds, and areas presenting high fire risks;
- areas required for the protection of water quality and reservoirs; and
- areas required for the protection and enhancement of air quality.

California has experience with the loss of life and property associated with development in hazard prone areas. Legislation has required local action to provide for the increased safety of residents from natural disasters such as floods, landslides, or earthquakes. Strict structural requirements have been the result of public demand for greater safety from the danger of earthquakes. While legislation will not guarantee against loss of life or destruction, rational development policies will minimize the dangers. Figures 7, 8, and 9 depict flood prone areas, areas of landslide activity, and areas of erosion activity, respectively.

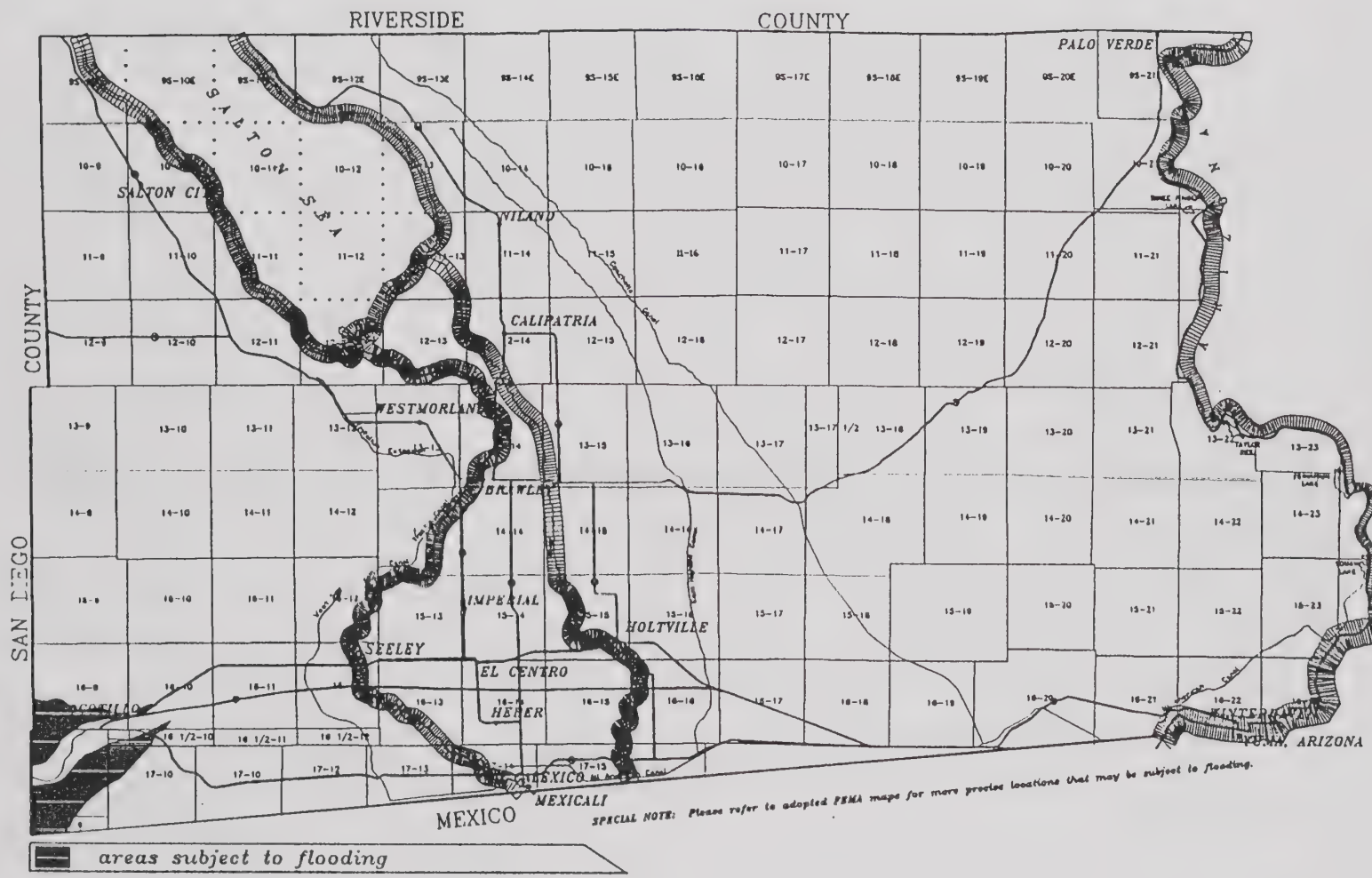
#### **Geologic Hazards**

Although located in the inland desert valley, Imperial County experiences periodic flooding. The Salton Sea was created in an unusual winter flood in 1905. A more common problem in the region of the southwest is "flash floods" which may originate many miles away in mountains or foothills. These floods often consist of a wall of water several feet high which may approach without warning into narrow washes, and presents an extreme danger to anything in its path.

The legality and desirability of flood plain zoning has been established by the State Legislature in the Cobey-Alquist Flood Plain Management Act. This act proposes a two district mapping system, the "floodway" or high velocity flow area, and the "restrictive zone", the low velocity area of the outer flood plain. A more detailed discussion of flood hazards and policies can be found in the Seismic and Public Safety Element.







SOURCE: Federal Emergency Management Agency

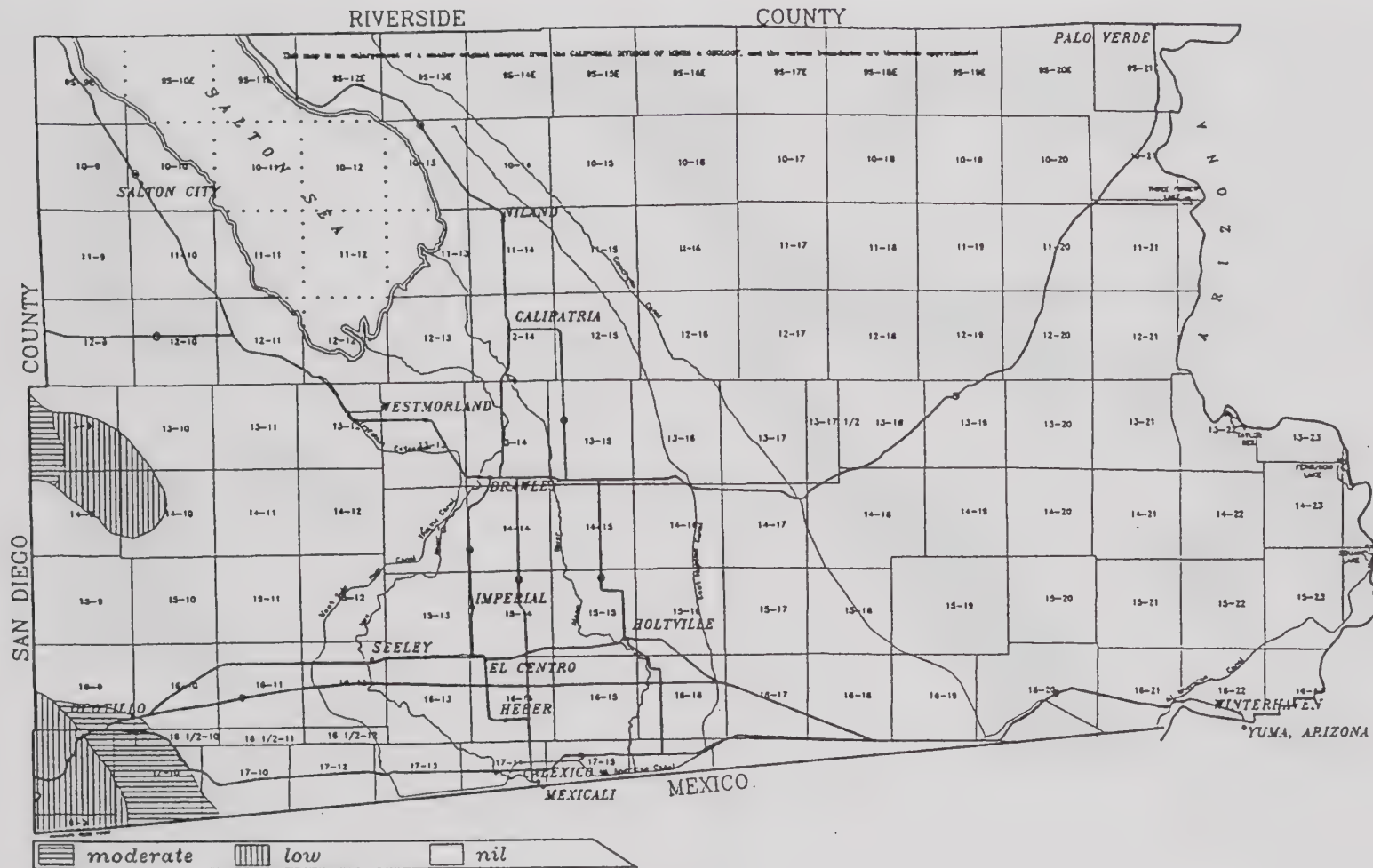
Imperial County  
General Plan

Flood Areas

Conservation and Open Space Element

Figure  
7





SOURCE: Department of Conservation  
Division of Mines and Geology

0 6 12 miles



Imperial County  
General Plan

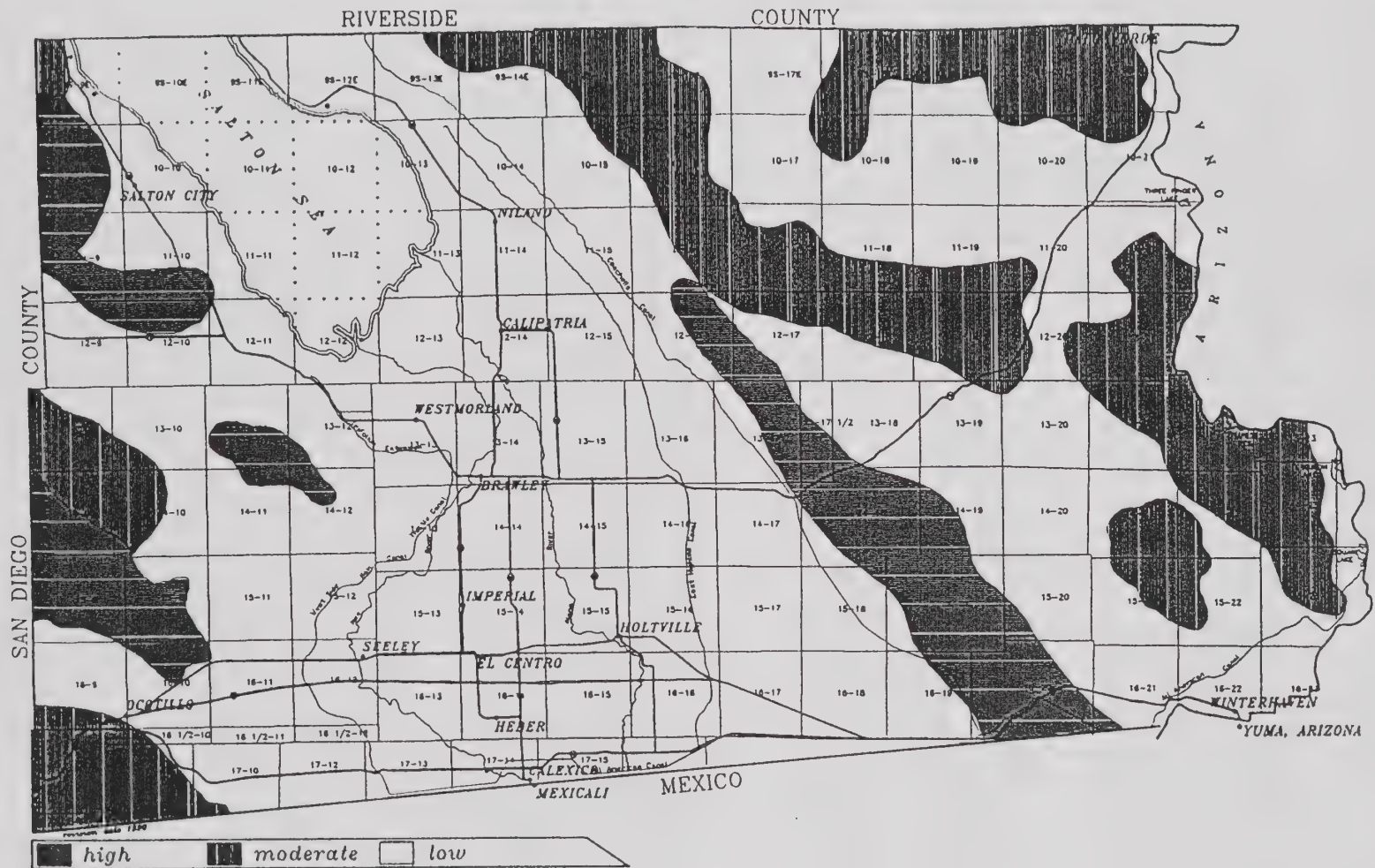
Landslide Activity

Figure  
8

Conservation and Open Space Element







SOURCE: Department of Conservation  
Division of Mines and Geology

Imperial County  
General Plan

Erosion Activity

Figure  
9

Conservation and Open Space Element



Imperial County is situated in a seismically active area which in some places may be identified by surface alterations. The Imperial, Superstition Hills, and Superstition Mountain Faults are part of the active San Jacinto Fault Zone.

The protection of public health and safety in areas of severe earthquake hazard requires an extensive analysis of the local geology. The Alquist-Priolo Special Studies Zones Act went into effect March 7, 1973. The purpose of the act is to prohibit the location of most structures for human occupancy across the traces of active faults and to thereby mitigate the hazard of fault ruptures. The County Planning/Building Department has on file for public use, a set of 18 maps prepared by the State of California identifying Special Study Zones delineated in compliance with Chapter 7.5, Division 2, of the California Public Resources Code.

The County of Imperial encourages that land identified as being within a "Special Study Zone", designated by the State Geologist to be maintained as open space, to the maximum extent possible. A more detailed discussion and policies are contained in the Seismic and Public Safety Element.

The identification of unstable soils, such as soils subject to subsidence, and shrink swell, is also an important consideration in establishing standards for the protection of the public health and safety. A detailed discussion of this subject is contained in the Seismic and Public Safety Element.

### **Airport Flight Zones**

Countywide aircraft facilities are identified in the Airport Land Use Compatibility Plan. Aircraft accidents are most prevalent in areas immediately adjacent to airports and primarily occur during takeoff and landings. The area of highest risk potential is at the end of runways where forced landings generally occur. Since Imperial County is the host for the El Centro Naval Air Facility, Imperial County Airport and other airports adjacent to urban areas, it is essential that the County develop and maintain techniques which protect people and property from aircraft accidents. A more detailed discussion is contained in the County's Airport Land Use Compatibility Plan.





### **III. GOALS AND OBJECTIVES**

#### **A. Preface**

The Conservation and Open Space Element of the General Plan serves as the primary policy statement by the Board of Supervisors for implementing policies to conserve the natural environment of Imperial County. This section of the Element presents Imperial County's Goals and Objectives relative to planning for the natural environment of the unincorporated areas of the County.

The Goals and Objectives, together with the Implementation Programs and Policies in Chapter IV, are the statement that shall provide direction for private development and industry as well as government actions and programs. Imperial County's Goals and Objectives are intended to serve as long-term principles and policy statements representing ideals which have been determined by the citizens as being desirable and deserving of community time and resources to achieve. These Goals and Objectives, therefore, are important guidelines for decision making relative to proposed projects and land use planning. It is recognized, however, that other social, economic, environmental, and legal considerations are involved in land use decisions and that these Goals and Objectives, and those of the other General Plan Elements, should be used as guidelines but not doctrines.

#### **B. Goals and Objectives**

##### **Conservation of Environmental Resources for Future Generations**

Goal 1: Environmental resources shall be conserved for future generations by minimizing environmental impacts in all land use decisions.

Objective 1.1 Recognize that the degradation of one natural resource will have a concomitant negative effect upon the total resource base, including water, vegetation, air, wildlife, soil, and minerals.

Objective 1.2 Encourage only those uses and activities that are compatible with the fragile desert, aquatic, and marshland environment.

Objective 1.3 Coordinate the acquisition, designation, and management of important natural resource areas in Imperial County with other appropriate governmental agencies as necessary.

Objective 1.4 Develop standards to protect significant natural resource areas for the purpose of enhancing both the planning and decision-making process.

Objective 1.5 Provide for the most beneficial use of land based upon recognition of natural constraints.

Objective 1.6 Ensure the conservation, development and utilization of the County's natural resources.



Objective 1.7 Provide the opportunity for enjoyment of a quality natural experience to present and future generations.

Objective 1.8 Encourage the acquisition of scientific knowledge by encouraging the preservation of important ecological, archaeological, and other scientific sites.

### **Preservation of Biological Resources**

Goal 2: The County will preserve the integrity, function, productivity, and long-term viability of environmentally sensitive habitats, and plant and animal species.

Objective 2.1 Conserve wetlands, fresh water marshes, and riparian vegetation.

Objective 2.2 Protect significant fish, wildlife, plant species, and their habitats.

Objective 2.3 Protect unique, rare, and endangered plants and animals and their habitats.

Objective 2.4 Use the environmental impact report process to identify, conserve and enhance unique vegetation and wildlife resources.

Objective 2.5 Give wildlife conservation a high priority in County park acquisition and development programs.

Objective 2.6 Attempt to identify, reduce, and eliminate all forms of pollution which adversely impact vegetation and wildlife.

Objective 2.7 Discourage the use of wild native animals as pets.

Objective 2.8 Adopt noise standards which protect sensitive noise receptors from adverse impacts.

### **Preservation of Cultural Resources**

Goal 3: Important prehistoric and historic resources shall be preserved to advance scientific knowledge and maintain the traditional historic element of the Imperial Valley landscape.

Objective 3.1 Protect and preserve sites of archaeological, ecological, historical, and scientific value, and/or cultural significance.

### **Preservation of Agricultural Lands**

Goal 4: The County will actively conserve and maintain contiguous farmlands and prime soil areas to maintain economic vitality and the unique lifestyle of the Imperial Valley.

Objective 4.1 Encourage sound agricultural practices.

Objective 4.2 Control and prevent soil erosion when possible.





Objective 4.3 Support the efforts of the Imperial Valley Drainage Advisory Committee by encouraging the conformance to their criteria for the reclamation of salt affected land.

### **Preservation of Mineral Resources**

Goal 5: The County will identify and protect mineral resources for extraction and minimize the effect of mining on surrounding land uses and other environmental resources.

Objective 5.1 Encourage the sound extraction of mineral and quarry/aggregate resources while protecting the natural desert environment.

Objective 5.3 Require that mineral extraction and reclamation operations be performed in a way that is compatible with surrounding land uses and minimize adverse effects on the environment.

Objective 5.4 Safeguard the use and full development of all mineral deposits.

Objective 5.5 Regulate the development adjacent to or near all mineral deposits and geothermal operations due to the potential for land subsidence.

### **Conservation of Energy Sources**

Goal 6: The County shall seek to achieve maximum conservation practices and maximum development of renewable alternative sources of energy.

Objective 6.1 Define and assure adequate energy supplies for Imperial County.

Objective 6.2 Encourage the utilization of alternative passive and renewable energy resources.

Objective 6.3 Maximize energy conservation and efficiency of utilization

Objective 6.4 Minimize environmental impact of energy sources.

Objective 6.5 Minimize possibility of energy shortages and resulting hardships.

Objective 6.6 Encourage compatibility with National and State energy goals and city and community general plans.

Objective 6.7 Support local utility company's energy conservation programs.



## **Preservation of Visual Resources**

Goal 7: The aesthetic character of the region shall be protected and enhanced to provide a pleasing environment for residential, commercial, recreational, and tourist activity.

Objective 7.1 Encourage the preservation and enhancement of the natural beauty of the desert and mountain landscape.

## **Preservation of Water Resources**

Goals 8: The County will conserve, protect, and enhance the water resources in the planning area.

Objective 8.1 Protect all bodies of water, e.g. Salton Sea, and water courses for their continued use and development.

Objective 8.2 Maintain the salinity of the Salton Sea at 40,000 parts per million salinity and encourage the advantageous usage of the Salton Sea for agricultural and natural drainage, recreation, and development.

Objective 8.3 Regulate development in or adjacent to water bodies and courses, protect water bodies and minimize property damage. Zone the areas around the Salton Sea below elevation -220 feet as open space to minimize property damage from fluctuating sea elevations.

Objective 8.4 Ensure the use and protection of the rivers and other waterways in the County. Ensure proper drainage and provide accommodation for storm runoff from urban and other developed areas in manners compatible with requirements to provide necessary agricultural drainage.

Objective 8.5 Protect and improve water quality and quantity for all water bodies in Imperial County.

Objective 8.6 Eliminate potential surface and groundwater pollution through regulations as well as educational programs.

Objective 8.7 Reclaim polluted water bodies, such as the New and Alamo Rivers and the Salton Sea, if deemed necessary.

Objective 8.8 Ensure protection of water bodies that are important for recreational fishing.

Objective 8.9 Prohibit the inappropriate siting of solid or hazardous waste facilities next to water bodies or over sources of potable groundwater or recharge basins. In association with the clean up of the New River, all existing landfills in or near the river should eventually be closed.

Objective 8.10 Discourage the use of hazardous materials in areas of the County where significant water pollution could pose hazards to humans or biological resources.





Objective 8.11 Identify watersheds (recharge areas) and key areas for the protection of water quality and groundwater.

Objective 8.12 Protect aquifer recharge areas including specifying minimum parcel size.

Objective 8.13 Encourage water conservation and efficient water use among municipal and industrial water users, as well as reclamation and reuse of wastewater.

Objective 8.14 Coordinate with the appropriate agencies for the availability of water to meet future domestic, industrial/commercial and agricultural needs.

### **Protection of Air Quality**

Goal 9: The County shall actively seek to improve and maintain the quality of air in the region.

Objective 9.1 Ensure that all facilities shall comply with current federal and state requirements for attainment of air quality objectives.

Objective 9.2 Cooperate with all federal and state agencies in the effort to attain air quality objectives.

### **Preservation of Open Space**

Goal 10: Open space shall be maintained to protect the aesthetic character of the region, protect natural resources, provide recreational opportunities, and minimize hazards to human activity.

Objective 10.1 Confine future urbanization within adopted Sphere of Influence areas.

Objective 10.2 Recognize the regional significance of the development and conservation of recreational opportunities in Imperial County.

Objective 10.3 Provide a broad range of recreational facilities for all ages and economic groups emphasizing family-oriented opportunities.

Objective 10.4 Encourage the acquisition and development of additional County recreational facilities.

Objective 10.5 Any recreational activity must be developed in such a manner as to minimize any significant environmental impact on humans and existing natural resources.

Objective 10.6 Encourage the development and improvement of recreational facilities in Imperial County.

Objective 10.7 Coordinate federal, state, and local agencies for trail-oriented recreational uses.



Objective 10.8 Recognize that certain lands are unsuitable for high density development, and that prohibition and restriction of such uses are in the public interest, health, and safety.

Objective 10.9 Conserve desert lands, within the county's jurisdiction for wildlife protection, recreation, and aesthetic purposes.

### C. Relationship to Other Elements

The Conservation and Open Space Element Policy Matrix (Table 1) identifies the relationship between the Conservation and Open Space Element Goals and Objectives to other Elements of the Imperial County General Plan. The Issue Area identifies the broader goals of the Element and the "Xs" identify that related objectives are contained in the corresponding Elements.

TABLE 1 CONSERVATION AND OPEN SPACE ELEMENT POLICY MATRIX								
Issue Area	Land Use	Housing	Circulation	Noise	Seismic/ Public Safety	Agricultural	Geothermal	Water
Environmental Conservation	X							X
Biological Resources	X			X				
Cultural Resources	X							
Agricultural Preservation	X					X		
Mineral Resources	X						X	
Energy Conservation		X						
Visual Resources	X							
Water Use	X				X			X
Air Quality	X							
Open Space	X				X			





## **IV. IMPLEMENTATION PROGRAMS AND POLICIES**

### **A. Preface**

The primary mechanism to implement the Goals and Objectives of the Conservation and Open Space Element is to incorporate environmental concerns into land use planning. This occurs primarily through the discretionary permit process of subdivision map review, rezones, conditional use permits, specific plans, and general plan amendments. Accompanying all of these applications is an environmental review process to identify significant site resources and evaluate project impacts.

In addition, the process of updating the County's resource data base needs to be a continual process of information exchange with County, State, and federal resource agencies. This includes the Bureau of Land Management, State Department of Fish and Game, U.S. Fish and Wildlife Service, Imperial Irrigation District, Soil Conservation Service, State Department of Conservation, Regional Water Quality Control Board, Air Pollution Control District, and many others.

### **B. Policies and Programs**

The following policies and programs describe activities which are intended to implement the Goals and Objectives that have been described in the previous section.

#### **1. Biological Resource Conservation**

##### **Policy**

Provide a framework for the preservation and enhancement of natural and created open space which provides wildlife habitat values.

##### **Programs**

- Identify Resource Areas (see Figure 3) to conserve and enhance native vegetation and wildlife. These areas shall include: BLM "Areas of Critical Environmental Concern (ACECs); areas of high value to wildlife; areas necessary for the protection and perpetuation of rare, endangered, and threatened species; and areas important for scientific study. Following identification of these areas, they shall be rezoned to limit development to low intensity uses which are compatible with resource conservation.
- Projects within or in the vicinity of a Resource Area, as defined in the Imperial County General Plan EIR, should be designed to minimize adverse impacts on the biological resources it was created to protect.
- Accept all donations of land which have high wildlife value. Where appropriate, Imperial County shall attempt to exchange donated lands of high wildlife value with other state, federal, or other resource agencies equipped to protect and manage such lands for other lands more appropriate to County needs.



- Preserve the native habitat of sensitive plants and animals through the dedication of open space easements, and by other means that will ensure their long-term protection and survival. Such easements shall preclude the erecting of any structures (temporary or permanent), placement of utilities, vegetation removal, or any other activities. These dedicated open space easements would also serve to reduce potential indirect impacts to sensitive biological resources that may result from human activities associated with future developments.
- Areas designated for biological open space preservation shall include buffers, which provide important breeding and foraging habitats for native and migratory birds and animals. Such buffers shall serve to separate future development from adjacent native habitat areas to ensure the perpetual regeneration of these habitats.
- Protect riparian habitat and other types of wetlands from loss or modification by dedicating open space easements with adequate buffer zones, and by other means to avoid impacts from adjacent land uses. Road crossings or other disturbances of riparian habitat should be minimized and only allowed when alternatives have been considered and determined infeasible.
- Rock outcrops which serve as significant boulder habitat for sensitive biological resources shall be included within open space easements.
- Preserve existing California fan palms in natural settings and other individual specimen trees which contribute to the community character and provide wildlife habitat.
- Preserve and encourage the open space designation of wildlife corridors which are essential to the long-term viability of wildlife populations.
- Integrate open space dedications in private developments with surrounding uses to maximize a functional open space/recreation and wildlife management system.

## Policy

Landscaping should be required in all developments to prevent erosion on graded sites and, if the area is contiguous with undisturbed wildlife habitat, the plan should include revegetation with native plant species.

## Programs

- Revegetation plans shall be submitted and approved by the Imperial County Planning Department and relevant resource agencies for the mitigation of sensitive habitat lost, and for disturbed areas created by roads or installation of facilities adjacent to native habitat. Such plans shall mitigate for the loss of sensitive habitat and habitat value based on a ratio consistent with accepted policy, as recommended by the State and federal resource agencies. These specifications shall include, at a minimum, the following:
  - Locations of ecologically appropriate planting areas.
  - Site preparation/remedial grading.





- Amounts, sizes, and locations of appropriate overstory tree species to be planted.
- Hydroseed/container stock planting mixes and locations for appropriate understory shrub species and groundcovers.
- Timing of planting (for example, most plantings should be conducted during the rainy season).
- Protective measures during and after plant installation, such as temporary chainlink fencing to keep out construction equipment/personnel; caging to avoid potential herbivory (animal browsing); and permanent wood-rail fencing or signage to deter human intrusions. This would also reduce potential impacts caused by future active uses, or "edge effects", from adjacent residential areas.
- Irrigation schedule which specifies timing, frequency, length, and method of watering to ensure successful plant establishment. For example, temporary irrigation through the use of drip emitters should be installed around each tree to encourage deep tap rooting. Irrigation may only be necessary for the first one or two years, but could be extended throughout the monitoring period as determined necessary by the consulting biologist.
- The proposed habitat restoration sites shall be monitored for an appropriate period of time to ensure long-term plant survivorship. Monitoring shall be conducted by a qualified biologist proficient at horticultural and botanical sampling methods. The biological monitor shall be present at the time of plant installation to ensure correct implementation. The monitoring program shall clearly specify success criteria (e.g., percent vegetative cover for shrub species, percent canopy cover for tree species, etc.) to be evaluated by the biological monitor on a quarterly basis. Annual reports detailing the progress of the revegetation effort in attaining these goals shall be submitted to the Imperial County Planning Department and relevant resource agencies.
- A maintenance program shall be implemented for the length of the monitoring period. Primary goals of the maintenance program shall include staking, weed control and replacement of planted material that is diseased or has died. If the proposed restoration sites are not meeting stated goals of the Plan, supplemental remedial measures, such as additional weed control or replacement plantings, shall be recommended during the monitoring and maintenance period.
- When appropriate, a bond or other security shall be provided for all required revegetation plans, which would be released by the County only after: 1) the consulting biologist has concluded that all specified success criteria have been met; and, 2) the County and other relevant permitting agencies have approved the successful completion of the plan.



- Clearing of shrubs, vines, and other native vegetation for purposes of fire control shall be coordinated with the local fire district, particularly in fire-prone areas. Where clearing is necessary, high-fuel plants shall be replaced with native, low-fuel plants. Where feasible or necessary for habitat protection, fire buffer clearing shall be done by hand so as to minimize disturbance to understory species. A list of important understory groundcover, shrubs, vines, ferns, and other vegetation shall be compiled by a qualified biologist, and included in all required landscape plans prior to final approval of individual projects.

## **2. Cultural Resources Conservation**

### **Policy**

Identify and document significant historic and prehistoric resources, and provide for the preservation of representative and worthy examples; and recognize the value of historic and prehistoric resources, and assess current and proposed land uses for impacts upon these resources.

### **Programs**

- The County will use the environmental impact report process to conserve cultural resources. Public awareness of cultural heritage will be stressed. All information and artifactual resources recovered in this process will be stored in an appropriate institution and made available for public exhibit and scientific review.
- Encourage the use of open space easements in the conservation of high value cultural resources.
- Consider measures which would provide incentives to report archeological discoveries immediately to the Imperial Valley College - Baker Museum.
- Coordinate with appropriate federal, state, and local agencies to provide adequate maps identifying cultural resource locations for use during development review. Newly discovered archeological resources shall be added to the "Sensitivity Map for Cultural Resources".
- Discourage vandalism of cultural resources and excavation by persons other than qualified archaeologists. The County shall study the feasibility of implementing policies and enacting ordinances toward the protection of cultural resources such as can be found in California Penal Code, Title 14, Point 1, Section 622-1/2.





### **3. Energy Conservation**

#### **Policy**

The County shall establish programs and procedures to encourage the conservation of energy by the general public.

#### **Programs**

- Promote the demonstration of new energy saving or supply technologies such as solar energy technologies on County facilities and the dissemination of information on their relative effectiveness and operating costs.
- Amend County Building Codes, in accordance with local conditions and State Energy Commission standards for both residential and nonresidential buildings, to include insulation requirements against heat infiltration in new construction.
- Encourage State legislation which would remove tax disincentives on capital investments in solar space cooling equipment.
- Amend County Building Codes to remove unnecessary obstacles to implementing energy conservation technology.

### **4. Mineral Resources Conservation**

#### **Policy**

Control the extraction of mineral resources in order to assure minimal disturbance to the environment, preservation of significant mineral deposits, and to protect mining operations from encroachment by incompatible land use.

#### **Programs**

- The County shall require all surface mine operators to submit surface mining and reclamation plans prior to beginning mining operations. Surface mining includes surface work incident to an underground mine. Such plans shall be processed by the Planning Department and shall require the approval of the Planning Commission. Following the approval of those plans and the commencement of surface mining operations, the Planning Department shall inspect each surface mining operation at least once a year, for the life of the operation to assure compliance with the mining plans.
- The County shall protect known mineral deposits and mining operations from the encroachment of incompatible urban land uses. All protected areas shall be reevaluated in light of future state reports identifying areas of regional and statewide mineral significance.



## 5. Open Space Conservation Policy

Identification of lands appropriate for open space conservation shall be included in the development review process. The application of regulatory controls must be non-confiscatory, non-arbitrary, and reasonable. It is not the intent of any of these measures to deny any landowners the reasonable use of his land, or be considered a "taking" under the law. The following are examples of various regulatory techniques:

### Programs

- The County Subdivision Ordinance may require the dedication of park land or the payment of a fee-in-lieu thereof. This device has not been utilized to date by the County. The developer should bear the costs for the increased pressure new subdivisions place upon existing facilities. Revenues realized by this device may be utilized for parks elsewhere in the County within a reasonable distance.
- Agricultural lands shall require a minimum parcel size of 40 acres for the preservation and protection of productive agricultural lands.
- A watercourse overlay zone should be included within the County Zoning Ordinance and applied where necessary to restrict or prohibit development in areas subject to flooding.
- Continue use of the "S" Open Space Zone for all unincorporated areas of the County not included in a precise zoning map.
- The Recreation and Public Purposes Act has been amended to include open space as a legitimate purpose. In the past, any land acquired had to be developed within a reasonable period of time. In 1973 the County was entitled to acquire 640 acres of Bureau of Land Management land per year at the cost of \$2.50 per acre. The County obtained 640 acres in the Hot Mineral Spa Area by this method.
- There are some lands in public ownership at the present time. The value and potential uses of these lands should be evaluated, and the possibility of exchanges for desirable open space or recreation lands explored.
- Acquisition of less than fee ownership can be accomplished with open space easements on privately owned lands for a term of not less than 20 years. Such lands must retain an open space character. Flooding easements had been utilized in the past in the Salton Sea area to limit damage caused by flooding. Also, the acquisition of a long-term lease can enable the County to preserve land for specified purposes. In the past, the County has leased the Truckhaven Archaeological Site pending State or Federal acquisition.
- The acquisition of development rights can also be used to permit the retention of the open character of certain land uses, notably agriculture. Incentive for owners to sell these rights





would result from a considerably lower tax assessment in view of the absence of development potential.

### **Policy**

The County shall participate in conducting detailed investigations into the significance, location, extent, and condition of natural resources in the County.

### **Programs**

- Encourage state and federal acquisition or management of areas or sites determined by the County and other agencies to possess important natural resource values, including small but significant landscape features and scientific sites.
- Participate in the process of site and area evaluation and analysis after an area is determined to possess natural resource value.
- Encourage acquisition of unique archaeological or scientific sites by State and Federal Agencies or non-profit organizations interested in preserving our cultural heritage.
- Allow only compatible land uses and consistent zoning adjacent to protected areas.
- Zone areas of natural resource value to preserve and protect their intrinsic values when applicable.
- Preserve unique sites and areas by controlling direct public access.
- Notify any agency responsible for protecting plant and wildlife before approving a project which would impact a rare, sensitive, or unique plant or wildlife habitat.

### **Policy**

The County shall discourage urban development on prime agricultural lands (Class II or III soils).

### **Programs**

- Recognize the incompatibility of small parcels to agricultural uses by adopting and enforcing large minimum acreage requirements in agricultural zones.
- Relate minimum acreage requirements in each zone to soil characteristics, climate, water availability, crop types, existing land use ownership patterns, and proximity to urban development.
- Encourage development of agriculturally related industries, such as packing and processing, on marginally productive lands.



- Consider creation of a fee or assessment on new development which converts land presently in agricultural use. The revenue would be used to purchase development rights or fee title to other land still in production or open space, as deemed necessary.

### **Policy**

The County shall recognize the economic importance of livestock production, as well as its incompatibility with urban uses, through zoning and development review programs.

### **Programs**

- Establish a plan and the required rezoning to prohibit feedlots in close proximity to residential or commercial uses. Conversely, these provisions should provide for the protection of feedlot operations from encroachment by residential and other incompatible urban uses.
- Establish adequate development and performance standards in the County Zoning Ordinance for animal husbandry, including dairies and feedlots, and appropriate animals per acre.

### **Policy**

The County shall take a pro-active role in working with local, state, and federal agencies to maintain and develop lands for outdoor recreation.

### **Programs**

- Encourage State and Federal Agencies to develop and operate recreational facilities which are determined by the County to possess more than local significance.
- Provide County input into state and federal recreation and wilderness areas so that the natural values of the area are preserved.
- Support controlled development of recreation facilities in primitive or wilderness areas so that the natural values of the area are preserved.
- Off-road vehicle (ORV) use is recognized as a popular recreational pursuit in the Imperial Valley. Areas which are not environmentally sensitive should be identified for this purpose.
- Encourage the recreational use of lands located in hazardous areas such as flood plains.
- Establish adequate development standards for private recreation facilities to assure the preservation of natural and scenic values.
- Implement subdivision regulations requiring developers to dedicate land for park or recreational use or pay a fee in-lieu thereof at the option of the County.





- Encourage the identification and designation of historic buildings, landmarks, and sites within the County.
- Encourage the acquisition of historic and cultural sites by public agencies or nonprofit organizations interested in their preservation.
- With the Imperial Irrigation District, explore the possibility of utilizing and improving certain portions of the canal system for picnic and fishing sites.
- Encourage the use of unobtrusive materials, structures, and color in power line transmission corridors. Vegetative screening is encouraged wherever possible.

## Policy

The County shall establish a program to identify open space necessary for the protection of public health and safety, such as floodplains, geologic risk areas, and airport flight zones, and maintain these areas in open space, agriculture, or other appropriate low intensity uses.

## Programs

- Floodway and floodplain boundaries shall be identified on County zoning maps when required studies have been completed.
- Structural development normally shall be prohibited in the designated floodways. Only structures which comply with specific development standards should be permitted in the floodplain.
- Limit use of floodplains to natural wildlife habitat, non-structural recreational use, and agricultural production.
- Some encroachment into floodplain areas may be permitted with proper hydrologic design, review by the Department of Public Works to assure that no public safety hazard is created, and a determination made that no significant impact to wildlife is created.
- Identify areas of known seismic activity and delineate on county zoning maps general areas in which development should be restricted.
- Control structural development upon or in the vicinity of an active fault.
- Require detailed engineering or soil studies on a case-by-case basis for development proposals located in an area characterized by soils of limited structural capabilities.
- Control development in areas of soil with properties which exhibit problems of erosion, limited bearing capacity, subsidence, shrink-swell, or slippage.
- Adopt General Plan designations and appropriate zoning to control residential uses in the aircraft flight zones and in areas which may be subjected to severe noise levels.



- Coordinate the review and consistency of projects near airports with the Airport Land Use Commission.

### **Policy**

The County will establish a policy to clean up the Salton Sea and the rivers of Imperial County, specifically the New River and the Alamo River, in order to promote water recreation activities.

### **Programs**

- The County of Imperial will work with Mexico to establish clean up procedures for the New and Alamo Rivers.
- Landfills located in or near the New River should eventually be closed as part of the New River clean up program.
- The County will evaluate and establish funding mechanisms and procedures to clean up the Salton Sea.





## APPENDIX A

SURVEY OF MINERAL AND SOIL RESOURCES**A. Minerals**

Significant opportunities, needs, and demands for minerals and raw materials exist in Imperial County's expanding economy. The more obvious needs are related to the inevitable construction demands. Additional sources of sand and gravel are needed even now. Utilization of limestone for cement from local sources will probably also become economically feasible. Gypsum, already mined, is likely to find expanding markets. Available sources of pumice and claystone for expanded lightweight aggregate lie ready for when the need arises.

Industrial materials such as kyanite, mineral fillers (clay, limestone, sericite, mica, tuff), salt, potash, and calcium chloride (geothermal sources) and sand (Algodones Sand Dunes) are readily available.

Low cost power sources can provide added incentive for industrial development, enhancing the value of the County's mineral resources. Minerals extracted in Imperial County of highest economic value are gold, gypsum, sand, gravel, lime, clay and stone.

Gold and manganese deposits of the County contain sizeable reserves. Current trends in developing efficient mining techniques and processing methods have proven successful in exploration of gold deposits in the Glamis Plateau area and the Cargo Muchacho and Picacho Mountains.

Uncontrolled urbanization has basically the same effect on mineral resources as it does on agricultural lands. The geographic extent of mineral resources is a function of geologic factors, thus mining operations are restricted to the relatively few locations of mineral deposits suitable for extraction. Urban development removes these resources from available reserves, at least for the foreseeable future.

This loss results not only from land uses situated atop potential extractive sites, but also from incompatible land uses on adjacent property. Extractive operations such as gypsum, sand, and gravel are particularly unwanted as neighbors by residential or commercial areas. Determination of the location, extent, and quality of mineral deposits is essential if they are to be protected from incompatible land uses.

The potential social and economic value of these resources is an important consideration when conflicting land uses are proposed. Mineral extraction provides employment, increased tax revenue, increased demand for local goods and services, and minerals or other materials at reasonable prices. These advantages must be weighed against the land requirements of other land uses and the possible impact upon the environment.

**Environmental Considerations.** The extraction industry may have significant impacts upon the natural environment. Damage has often been the result of failure on the part of local or state government to effectively regulate these uses. Without regulatory requirements, the industry is not required to take the necessary precautions.



Air quality is also of increasing concern to residents of Imperial Valley. The extensive areas of dust and sand create a high ambient dust level in the unirrigated portions of the County. Furthermore, agricultural burning also contributes significantly to reduced air quality. Open or surface mining may produce excessive amounts of dust which will require effective control measures to mitigate or prevent deterioration of air quality.

Extractive operations may also accentuate geologic hazards. The possibility of subsidence resulting from extraction of geothermal brine is discussed in the Geothermal and Transmission Element.

The possible effect of mineral extraction on surface and groundwater must also be considered. Mining operations must meet water quality standards established by the State Water Resources Control Board and the Regional Water Quality Control Board - Colorado River Basin Region 7. Regulations limiting discharge of mining waste materials generally prohibit pollution of ground or surface waters.

Recognition of public health and safety is important, particularly in view of the number of serious injuries resulting from abandoned mine shafts in the desert. If the mine is subsurface, the shaft should be sealed at the surface upon abandonment or completion of operations.

Mineral extraction, while often uncovering items of archaeological significance, frequently destroys the fragile setting and artifacts of the site. When considering applications for mining operations in areas of archaeological or other scientific interest, an on-site evaluation of the sites historical or archaeological value must be provided by the applicant and prepared by a qualified archaeologist.

Extractive industry in the local context may be highly visible, therefore aesthetic considerations are particularly important. While many of these operations are open, they should be shielded as much as possible from public view. Review of the probable impact of the extractive industry also requires that the potential noise impact on plants and wildlife be critically examined.

**Surface Mining and Reclamation Act of 1975.** Mining operations on federal, state and private lands are subject to the California Surface Mining and Reclamation Act (SMARA) of 1975. SMARA, enacted as Chapter 9, Division 2 of the Public Resources Code, requires the State Mining and Geology Board (under the California Department of Conservation, Division of Mines and Geology) adopt policies for the reclamation of mined lands. The law, to date, has been amended by Assembly Bill (AB) 1300-1980; AB 1110-1984; Senate Bill (SB) 593-1985; SB 1261-1986; and Assembly Bill 747-1987. The last amendment, in 1987, was also the most substantial policy change to SMARA.

SMARA is the state's answer to two seemingly contradictory demands - the need for a continuing supply of mineral resources and the assurance that significant adverse impacts of mining will be mitigated. The County Planning/Building Department as lead agency has the responsibility under SMARA, as amended, and State Policy for Surface Mining and Reclamation Practice, to regulate surface mining and reclamation within its jurisdiction including the reclamation of federal lands so as to assure that:

1. Adverse environmental effects are prevented or minimized and that mined lands are reclaimed to a usable condition which is readily adopted for alternative land uses.





2. The production and conservation of minerals are encouraged, while giving consideration to values relating to recreation, watershed, wildlife, range and forage, and aesthetic enjoyment.
3. Residual hazards to the public health and safety are eliminated (Public Resources Code Section 2712).

Under the Surface Mining and Reclamation Act of 1975, with specified exceptions, a person is prohibited from conducting surface mining operations unless a permit is obtained from, and a reclamation plan has been submitted to and approved by, the lead agency for the surface mining operation. A person who obtained a vested right to conduct surface mining operations prior to January 1, 1976, is not required to obtain a permit, but is required to submit a reclamation plan to the lead agency. The State Mining and Geology Board is required to review lead agency ordinances which establish permit and reclamation procedures.

In order to comply with SMARA, the County enacted Chapter 4.5, Surface Mining Operations into the Imperial County Ordinance (Sections 83450-83463). In addition, "Policies and Standards for Development and Reclamation of Natural Resource Areas", were adopted by the Board of Supervisors, on September 25, 1979.

AB 747 also clarified the definition of "lead agency" by specifying that cities and counties, and certain state agencies with land use regulatory authority, are lead agencies under SMARA. Pursuant to this, the County Board of Supervisors and the Bureau of Land Management (BLM), El Centro Resource Area have prepared and signed a Memorandum of Understanding (MOU) effective August 12, 1988.

The MOU is an agreement to have the County process reclamation plans for mining operations located on federal lands for the BLM in order to avoid duplication efforts. The County and BLM have developed an effective and efficient permit system that meets the regulatory requirements without seriously disrupting development and operation of such projects.

In November of 1989, the State Office of Mines and Geology conducted a statewide survey to ascertain compliance with the requirements of SMARA. At that time it was found that there was substantial noncompliance by lead agencies. Of 116 mines analyzed only eleven percent were verified as being in compliance, and of the total reclaimed, thirty percent of the sites were determined to be unreclaimed or not reclaimed to SMARA standards. Additionally, the Bureau of Mines and Geology also determined that only a few agencies carried out site inspections and less than fifty percent of the lead agencies had notified the mining operations that were out of compliance.

As a result of the above survey, the Division of Mines and Geology informed the lead agencies that unless substantial compliance is immediate, it is their intent to pre-empt the SMARA program to the State Mines and Geology Board. There is legislation, AB 3551, which imposes substantially new and much more complex regulations on surface mining operations.

From the onset, Imperial County has pursued implementation and compliance with SMARA. Imperial was one of the few Counties found to be substantially in compliance with state requirements. Should SMARA be taken away from the local jurisdiction's control, compliance will become much more time consuming, with review and approvals required at the state level. Additionally, the process would



become more costly with substantially higher review fees and severe penalties for tardiness or noncompliance. In addition, local concerns and issues become unclear and statewide mandates become a burden to the local operations.

## 1. Gold

By far the greatest number of mineral deposits in Imperial County are those developed for the recovery of gold. Of approximately 220 mineral deposits listed by the California Division of Mines and Geology in the report *Geology and Mineral Resources of Imperial County, California*, 1977 by Paul K. Morton, about seventy five are gold mines or prospects.

Gold has been mined in Imperial County, with varying degrees of success since the late 1700's. In the above mentioned report, gold was ranked second to gypsum in total value of mineral production. Considerable development of gold has occurred since 1985, and gold now ranks as the mineral of highest economic value to the County.

Currently, three major mines are actively producing gold in Imperial County according to the U.S. Bureau of Mines. In 1988, Imperial County was the largest producer of gold in California, due primarily to the Mesquite Mine owned by Gold Fields Operating Company. Mesquite Mine and McGlaughlin Mine in Napa County compete closely as the largest producers in the State, and the two combined comprise about one third (1/3) to one half (1/2) of gold production in California. Recent figures from the U.S. Bureau of Mines in Washington indicate that Mesquite Mine, McGlaughlin Mine and Jamestown Mine in Tuolumne County account for approximately twenty-five percent of the United States gold production.

The most productive gold producing areas in the County are the Cargo Muchacho Mountains, the Picacho district, the Paymaster district, and the Potholes area. All of these areas lie within a 600 square mile region centered in the Southeastern corner of the County. The region embraces the Cargo Muchacho Mountains and the southeast half of the Chocolate Mountains. A few mines or prospects are known in the Northwestern Chocolate Mountains and in western Imperial County.

In 1985, the Bureau of Land Management, El Centro Resource Area, and the County approved the Plan of Operations and Conditional Use Permit for Gold Fields Operating Company's Mesquite Gold Mining and Processing Project. The mine is located approximately six miles east of the townsite of Glamis. Estimated reserves for this project are 56,000,000 tons with an average gold ore grade of 0.05 ounces per ton. There are 150,000 ounces of gold produced annually with a projected twenty year mine life.

In 1987, an expansion of the Mesquite project was approved, based on newly identified ore reserves, known as the VCR Project (Vista-Cherokee-Rainbow). These three new pits added 50,000,000 tons of ore with an average grade of 0.04 ounces per ton. This brought total gold annually produced by Gold Fields to 175,000 ounces. Both projects are immediately adjacent to each other, and when taken together represent the fifth largest deposit in the United States.

In 1987 another gold mine was approved about twenty-eight miles to the southeast in the Cargo Muchacho Range. This mine, the Padre/Madre, operated by American Girl Mining Corporation, has





a projected life of ten years, with gold ore reserves of 6,000,000 tons, and an average grade of 0.04 ounces per ton. Annual production is about 24,000 ounces.

Chemgold, Inc. a subsidiary of Glamis Gold, is successfully operating the Picacho Mine as an open pit leach operation. About 24,000 ounces of gold per year is produced from patented mining claims. This project was approved in 1987 by the Imperial County Board of Supervisors, and was the original mine that proved the feasibility (both from an engineering and economic standpoint) of the low grade disseminated deposits characteristic of Imperial County.

In early 1988, in the Picacho Peak area, a test 50,000 ton heap leach facility was being operated by a Canadian company, Christie Gold, Limited, to determine the metallurgical characteristics of a relatively small, low grade (approximately 0.03 ounces of gold per ton) deposit that has been identified between the Colorado River and Picacho Mine.

In late 1988, a second mine operated by American Girl Mining Company, in a canyon east of the Padre/Madre mine was approved. This mine, known as the American Girl Canyon Project is both a heap leach open pit as well as an underground mine with conventional milling facilities. The open pit portion of the project has reserves of 5,500,000 tons with an average ore grade of 0.05 ounces per ton. The underground portion has reserves of 1,500,000 tons with an average grade of 0.20 ounces per ton. This new project will have a life of eleven years and will boost American Girl Mining Company's gold production from the combined projects to 60,000 ounces per year.

Farther north from the Cargo Muchacho Mountains, six miles east of Ogilby Road, along Indian Pass Road, Imperial Gold is developing the Indian Rose Deposit. This will also be a large scale open pit gold mine with minimum reserves noted at 16,000,000 tons. Permitting for this project is expected to begin in the fall of 1992.

In 1989, Homestake Mining and later on Newmont Exploration (1990) applied for permits to conduct exploratory drilling in the northwestern portion of the County near the Torrez-Martinez Indian Reservation. In 1989, Battle Mountain Exploration Company conducted exploratory drilling in the Imperial Gables area north of the junction of Highway 78 and Ogilby Road. Imperial Mining (Paragon) applied to do similar work in the same general vicinity, but their project has been delayed due to the recent listing of the desert tortoise as an endangered species by the U.S. Fish and Wildlife Service. Imperial Gold is currently in the permitting process to do extensive exploratory work along Indian Pass Road north of the Cargo Muchacho Mountains. In 1991, American Girl Mining obtained permits to conduct a drilling program in the area immediately east of the American Girl Canyon Project.

Chemgold is presently preparing the required environmental documentation for the expansion of its Picacho mining operation.

## **2. Gypsum**

The Fish Creek Mountains gypsum deposit constitutes the largest reserves of this commodity in California. More than 31.2 million tons of gypsum has been mined from this deposit. Of that, 30.1 million tons have been extracted by U.S. Gypsum Co. since 1945. Since 1984, an average of one



million tons of gypsum is produced by U.S. Gypsum Company's Plaster City Plant each year. This is the sole active gypsum mine in the County, and the largest gypsum mine in the United States. Seven counties in the State of California produce crude gypsum. In 1987, 1,924,074 short tons of crude gypsum were produced statewide, being valued at approximately \$39 million dollars (U.S. Bureau of Mines). The Plaster City Quarry accounts for fifty-two percent of that, and the expected life of the deposit at current production rate is just over 100 years. Gypsum mined in the County is used to manufacture both raw and calcined gypsum products. Raw gypsum products are portland cement rock which is crushed, sized gypsum used to retard set in cement, and agricultural gypsum which is used as a soil amendment.

Other raw gypsum products are more specialty products such as fillers for a variety of industries and a feed grade sold for agricultural use. Calcined gypsum products or succos are used to produce a full line of plaster products including casting, molding, flooring, and base and finish coat wall plasters.

Some of these plaster products require a high purity (93%) and high whiteness (72% versus Titanium Oxide Standard) rock which amounts to about ten percent of the total rock produced. The remainder of all other products require rock purities in excess of eighty-eight percent but typically all products average ninety-four purity which is the average field purity of the deposit. The majority of stucco usage (80%) is for wall board manufacture both at the Plaster City Plant and Santa Fe Springs, a satellite plant in the Los Angeles area. The Plaster City board lines produce a full line of board products including regular half (1/2) inch and five eighths (5/8) inch wall boards and specialty wall boards, such as fire rated board, water resistant panels, shaft wall liners, mobile home board, vinyl covered board, rock lath, plaster base board, and exterior sheathing.

As Southern California continues to grow, Plaster City continues to be strategically located to serve the market. As a resource area, no other suitable gypsum deposit of sufficient size and purity for wall board and plaster manufacture exists on the West Coast. Gypsum must be imported from Baja California, Mexico, or finished products transported in from Nevada, Arizona, Utah, or New Mexico.

Even though the vast gypsum deposits of Imperial County were known to exist many years prior to 1922, no successful attempt to mine the deposits was made until after the construction of the San Diego and Arizona Eastern Railroad in 1920. A narrow gauge railroad connecting the deposit with the main line was completed in October 1922 by the Imperial Gypsum and Oil Corporation. Only crude gypsum was shipped until the properties were acquired by Pacific Portland Cement Company, which completed a 300 tons per day calcining plant in late 1924. This company mined the deposit until July 1945 when the operation was sold to the United States Gypsum Company. The United States Gypsum Company expanded and modernized the plant facilities at Plaster City and has since maintained a steady output.

Access to the Fish Creek Mountains gypsum deposits is via a paved road, ten miles south of Ocotillo Wells on State Highway 78, twenty-two miles west from the junction with State Highway 86. Also, a narrow gauge railroad, owned by United States Gypsum Company, runs from the company's quarry at the deposit to their calcining and wallboard plant at Plaster City, twenty-five miles to the south.

The Fish Creek Mountains gypsum deposits are remnants of a formerly thick bed that probably covered a much larger area than is presently exposed. The largest and thickest remnants are in the northwest half of the property owned by the United States Gypsum Company. To the southeast, on United States Gypsum's property, erosion has separated the gypsum into detached bodies. The gypsum on the northeast side of the wash dips beneath the alluvium and reappears on the other side. This body is





controlled by California Portland Cement Company. Another large remnant lies above the cliff near the County boundary on the southwest limb of the previously mentioned anticline and is owned by National Gypsum Company. A 100 foot thick remnant, known to contain celestite (a form of gypsum), occurs just north of Fish Creek Wash on land which is now on state park property.

Other lesser deposits of gypsum are known to occur in the Coyote Mountains to the south. Most of the beds, which occur interbedded with claystone in the Imperial formation, are only a few feet thick.

### **3. Sand and Gravel**

1988 records with the U.S. Bureau of Mines reflect eight construction quality sand and gravel operations run by four operators: Desert Gravel Co., Aggregate Products, Imperial County Road Department and Tar-Mac Roadstone U.S.A., Inc. In 1988, production equaled 753,884 short tons, valued at \$2,604,613. Construction materials such as sand and gravel are high bulk, relatively low value resources. As the distance between the point of extraction and potential utilization increases, the cost increases significantly. Suitable sand and gravel deposits may exist in only a limited number of sites within the County; extraction will logically locate at those locations. If these areas are not designated as resource areas and incompatible uses are permitted, they are essentially lost.

Imperial County does not possess any deposits classified as "good", however, "fair" sources of gravel are found in the Yuha area, along the ancient beachline, and in alluvial fans at the base of the eastern mountains. The basis of the value depends on gradation, quality, accessibility, or depth to the water table and must be examined on-site on an individual basis. Adequate quantities of usable sand are available along the ancient beachline. The dune sands are less suitable for concrete because its spherical shape restricts hardening. While not of exceptional quality or suitability, available sand and gravel resources could be utilized to meet local demands.

### **B. Soils**

Most of the information contained in this section summarizes information existing in the Soil Survey of Imperial County California, Imperial Valley Area, prepared by the United States Department of Agricultural, Soil Conservation Service (SCS), in cooperation with University of California Agricultural Station and the Imperial Irrigation District (October 1981). Major field work for the survey was conducted during 1962-1975.

The soil survey contains information useful in land use planning, particularly predictions of soil suitability for selected land uses. Also addressed in the survey are limitations or hazards to land uses that are inherent in the soil, improvements needed to overcome these limitations, and the impact that selected land uses will have on the environment.

Great differences in soil properties can occur even within short distances. Soils may be seasonally wet or subject to flooding. They may be shallow to bedrock. They may be too unstable to be used as a foundation for buildings or roads. Very clayey or wet soils are poorly suited to septic tank leach fields.

A high water table makes a soil poorly suited to basements or underground installations. These soil properties, in addition to others are described in the SCS Soil Survey.



The soils of Imperial Valley consist of silty clays, silty clay loams, and clay loams that have formed on nearly level old lakebeds and floodplain deposits. The soils are generally deep, highly calcareous, and usually contain gypsum and soluble salts. The central irrigated area served by the District generally has fine textured silts. Sandy soils predominate in higher areas, such as the East and West Mesas, and are typical of most of the deserts in the Southwest United States. These soils do not have well defined horizons and are several thousand feet deep.

The SCS Soil Survey identified ten major soil associations comprising the following two groups based on landscape:

- (1) Well drained to poorly drained soils, dominantly in the lacustrine basin.
- (2) Well drained and somewhat excessively well-drained soils, dominantly on the East Mesa and the West Mesa.

A general soil map contained in the SCS Soil Survey depicts the soil associations in the survey area. This soil map gives a broad perspective of the soils and landscapes to provide a basis for comparing large areas for general land use; it is not suitable for planning the management of a farm or field or for selecting a site for a road or building or other structure. There are six major soil associations that predominate in the lacustrine basin portion of the Valley and four major soil associations that are dominantly on the East Mesa and on the West Mesa.

Soils found in the lacustrine basin are nearly level and are moderately well drained to well drained, except for soils adjacent to the Salton Sea, which are poorly drained. Soils in the basin area are mainly used for crop production through irrigation and constitute over sixty percent of Imperial County.

Extensive irrigation and seepage from canals over the years has given rise to a perched water table present in most soils in the lacustrine basin of Imperial County. There are also low lying areas around the Salton Sea with observed high salinity that are not used for agriculture.

Dominant soils on the East and West Mesas are nearly level to moderately steep. These well drained soils are generally used for desert recreation or as desert wildlife habitats and are not productive for agriculture, except for a few areas of Rositas soils.

The more specific location of each kind of soil (45 varieties) is shown on detailed soil maps in the SCS Soil Survey. The various kinds of soil in the survey area are described, and information is included about each soil for specific uses.

For additional information, or a copy of the soil survey, contact the local Soil Conservation Service or the U.C. Cooperative Extension Service. A copy is also on file in the Imperial County Planning Department for review.

## **1. Soil Description**

Agriculture in the Valley is practiced primarily in the lacustrine basin of Imperial County, which was formerly occupied by Lake Cahuilla. A few isolated areas in the basin are used for urban and agro-





industrial development, water impoundment, desert wildlife habitat, and recreational purposes. Soils located on the East and West Mesas surrounding the lacustrine basin are mainly used for desert recreation or as desert wildlife habitats with a few isolated areas of intensive agriculture.

The 1981 SCS Soil Survey of Imperial County groups the soils found in the lacustrine basin into the six soil associations for broad interpretive purposes described below, making up sixty-six percent of the survey area:

**a. Well Drained to Poorly Drained Soils Dominantly in the Lacustrine Basin**

**Imperial**

Nearly level, less than two percent slope, and moderately well drained silty clays. These very deep calcareous soils formed in alluvial deposits constitute approximately thirteen percent of the survey area; Eighty-five percent of the soils in this association are Imperial soils used for the production of field crops and homesites. The natural drainage of these soils and other soils in the basin has been altered by seepage of irrigation water from canals and through extensive irrigation. Tile drains are necessary to maintain the water table below the root zone.

**Imperial-Holtville-Glenbar**

Soils in this association are nearly level with slopes of less than two percent and moderately well drained to well drained silty clays, silty clay loams, and clay loams. This group is comprised of forty percent Imperial soils, twenty percent Holtville soils, and twenty percent Glenbar soils. As with most soils in the lacustrine basin, problems associated with perched water exist in this group. Soils in this group are mainly used for the production of field and vegetable crops with a few areas used for homesites.

The Imperial and Imperial-Holtville-Glenbar soils are limited for the construction of homes mainly by the shrink-swell potential, low strength, and wetness. Septic tank absorption fields are limited by the perched water table and slow permeability. Foundations and septic tank absorption fields need to be specially designed.

**Meloland-Vint-Indio**

With slopes of less than two percent, these soils make up about sixteen percent of the survey area. This group is comprised of thirty percent Meloland soils having a sandy loam surface layer and silty clay subsurface below two feet, twenty five percent Vint soils consisting of a fine sandy loam surface layer and loamy very fine sand underlying the surface, and twenty percent Indio soils of very fine sandy loam. Roughly two-thirds of these well-drained soils are located in the lacustrine basin and the remaining are located on low fans of West Mesa. Soils in this association, where irrigated water is available, are mainly used for field or vegetable crops with a limited amount of citrus production. Soils located on the West Mesa are used for desert recreation or wildlife habitats, due to the lack of water available for irrigation.

**Niland-Imperial**



Soils in this association have slopes in the range of zero to two percent and are moderately well drained, although natural drainage has been altered in extensively irrigated areas. A significant portion of these soils are located in the northeastern area near the town of Niland. This soil group constitutes only four percent of Imperial County and is comprised of two-thirds Niland soil and about one-fourth Imperial soil. A few areas in the soil group are used for field or vegetable crops. Desert recreation and wildlife habitats are the major uses of the land, although most of the land is left idle.

### **Glenbar-Imperial**

Soils included in this association make up only two percent of the soils in Imperial County dominantly in basins on West Mesa. These soils are nearly level with zero to two percent slopes and moderately well drained to well drained silt loams, clay loam, silty clay loam, sand, fine sand, and silty clay. Glenbar clay loam soils comprise about sixty percent of this soil association while Imperial soils represent about twenty-five percent. Most of the areas associated with this soil are barren or support scattered salt-tolerant ephemerals. Land uses consist of desert recreation and wildlife habitats.

### **Fluvaquents**

This group of strongly saline soils formed in alluvium are located along the edge of the Salton Sea. These soils have slopes of less than one percent and are poorly drained. Fluvaquent soils exhibit stratified layers ranging from silty clay to fine sand. Depth to water table occurs three feet below the surface of these soils, which constitute less than one percent of all soils in the Imperial County; ninety-five percent of this soil group consists of fluvaquents, with the remaining portion somewhat excessively well drained Rositas soils on dunes. Land in this soil is not conducive to agriculture because the soil lacks drainage outlets and is subject to flooding when the Salton Sea rises.

#### **b. Well Drained and Somewhat Excessively Drained Soils Dominantly on East Mesa and on West Mesa**

Soils on the East and West Mesas are identified in the SCS Soil Survey of Imperial County according to four soil associations, and make up about thirty-four percent of the survey area:

### **Rositas**

These soils make up about twenty percent of the survey area, with slopes ranging from zero to thirty percent. The soils are somewhat excessively drained sand, fine sand, and silt loam. The plant cover includes shrubs of creosote-bush, ephedra, white bursage, wingscale, and desert buckwheat, with big galleta grass and numerous ephemerals. Areas of this unit are mainly used for desert recreation and as desert wildlife habitat. Some parts are sources of sand and gravel. A few areas of Rositas soils are used for field or vegetable crops and citrus.

### **Rositas-Superstition**

Found on East Mesa, this map unit makes up about eleven percent of the survey area. It is about sixty-eight percent Rositas, twelve percent Superstition soils, and twenty percent minor soils. Slopes are





zero to two percent, somewhat excessively drained loamy fine sand or fine sand. Natural vegetation is a sparse cover of creosote-bush, ephedra, white bursage and wingscale. Areas of this unit are mainly used for desert recreation and as desert wildlife habitat.

### **Antho-Superstition-Rositas**

This unit makes up about two percent of the survey area, most areas are on West Mesa. Slopes are nearly level, consisting of zero to two percent. The soils are well drained and somewhat excessively drained fine sand and loamy fine sand. The natural vegetation is creosote-bush and desert ephemerals. Areas are used for desert recreation, as desert wildlife habitat, and as military test ranges.

### **Holtville-Antho**

Found predominantly on East Mesa, soils are nearly level, well drained loamy fine sand, loam, silty clay loam, and silty clay. The sparse natural vegetation is creosote-bush and desert ephemerals. This unit makes up about one percent of the survey area, being about forty percent Holtville soils, twenty percent Antho soils, and forty percent minor soils. Areas of this unit are used for desert recreation, as desert wildlife habitat and as military ordinance ranges. A few places are sources of clay for road base and canal lining.

Soils that exhibit a profile that is similar constitute a soil series. Soils of a series have major horizons that are similar in composition, thickness, and arrangement in the profile but may differ in texture of the surface layer of the underlying substratum. These differences in a particular soil series result in division of the series into phases. A summary of all soil phases in a soil series, including miscellaneous soil types identified in Imperial County can be found in the soil survey. Based on information contained in the soil survey, it is apparent that the following soil series predominate in the agriculturally developed areas of the valley:

<u>Soil Series</u>	<u>Total Area Acres</u>
Imperial	Over 210,000
Glenbar	Approximately 95,000
Holtville	Over 80,000
Vint	Over 60,000
Meloland	Approximately 60,000
Indio	Approximately 40,000

Rositas and Superstition soil series predominate on the East and West Mesas with over 280,000 acres and approximately 19,000 acres, respectively.



## 2. Soil Characteristics

SCS has classified soils in the Imperial Valley into capability classes, subclasses, and units showing the general suitability and limitation factors of soils for most kinds of field crops. Soils are classified according to their limitations when they are used for field crops, the risk of damage when they are used, and the way they respond to treatment. Capability classification does not take into account major land reforming, reclamation, or management of the land. The SCS groups the capability classes into the following categories: Classes I-IV are suitable for agriculture if irrigated, Classes V-VI are marginal, and Classes VII-VIII are unsuitable for agriculture. Based on these classifications, most of the acreage in Imperial County appears to be suitable for agriculture if irrigated.

A brief discussion of the potential for producing general field and vegetable crops on each soil type is presented in the SCS soil survey.

## 3. Salt Buildup in Soils

The relatively high level of dissolved salt in irrigation waters and the clayey nature of soils in most parts of Imperial Valley combine to produce ideal conditions for salt buildup in the soil. Crops vary in their sensitivity to salinity, but all of these suffer a loss in yield ranging from a few percentage points to total crop failure, depending on the severity of salt buildup. This phenomenon is well recognized by growers in this area. To combat salt buildup, they must either:

- (1) Apply additional irrigation water beyond consumptive use requirement.
- (2) Leach accumulated salts periodically through flooding of the affected plots of land for an extended time period.

Without these remedial actions, land becomes economically unproductive after a few seasons of normal crop production under irrigation. Provision for the leaching requirement in the application of irrigation water is routine in most areas; however, the extent of the requirement is a function of the salt content of the applied water and the degree to which salt concentration has already taken place in the soil. Thus, a reduced salinity level in the applied water could reduce the present leaching requirement. These water savings would be accompanied by a steady reduction in the soil salt content over the years, which, in turn, would also result in increased crop yields and would enable the farmer to change to more intensive, higher valued crops.

It has been estimated that about one-quarter of the irrigable lands were adversely affected by salt and high water tables in 1919. In 1940, an Imperial Valley Drainage Advisory Committee was formed.

The Committee supervised a ten year investigation of drainage methods by technicians of the Soil Conservation Service and the Imperial Irrigation District (IID). Satisfactory criteria for drainage and reclamation of salt affected land in the area were developed. Currently, approximately 31,552 miles of tile drains underlie 438,893 acres of land within the Imperial Irrigation District boundaries.





#### 4. Limitations on Land Use

Soil characteristics must be evaluated with particular land use in mind. For example, allowable soil pressure has little effect upon irrigated agriculture; however, it would be of primary importance where a high rise structure is contemplated.

Steep or excessively flat land does not preclude development, however construction in these areas generally entails greater investment. Total investment includes not only the cost of the structures but also site preparation, site development, utility services, and provision of drainage facilities and access roads. This investment in physical construction in certain areas is not the sole factor in determining the feasibility of developments, however it may be a significant consideration. Few steep slopes which would present potential difficulties are found in the urban areas of the County. However, excessively level lands may pose problems, as a slope of less than one percent drains poorly; this difficulty may be compounded by the run off characteristics of particular soil types. Most of the urban areas are located on exceedingly level terrain. While annual precipitation is minimal, it is often very intense.

The level terrain, soils of low permeability, and large quantities of rainfall over a short period result in flooding in some areas, a notable example is the Winterhaven area. Additionally, the Ocotillo area has numerous major and minor washes which may present serious hazards if development is permitted in their path. Development in these areas must devote particular attention to these physical limitations.

Soil characteristics may create conditions which endanger structures or inhabitants. Two primary areas of concern are susceptibility to shrink swell and limitations on allowable soil pressure. Soils which exhibit these two limitations are considered unstable. The location and extent of unstable and unsuitable soils and geologic hazard areas is discussed in the Seismic and Public Safety Element.

Desert soils form a shallow, fragile crust or "pavement" which serves to reduce wind erosion. When this poorly developed layer is disturbed, such as by off-road vehicles, susceptibility to wind erosion is greatly increased. While significant amounts of dust or sand are not normally moved for great distances, removal of soil may continue until the next substantial rainfall re-establishes the crust.

The management of soils is important for controlling erosion, increasing soil productivity, assisting in watershed management and flood control, and aiding in the rehabilitation of eroded or damaged areas.

Soil characteristics do not dictate the type of development that a particular site may accommodate, however, it does have a significant influence. The costs of overcoming severe soil limitations may make the site economically unfeasible for certain land uses. As development pressure intensifies, the engineering and design necessary to overcome these limitations may be economically justified.

The following is a list of the names of the members of the American Medical Association who have been elected to the office of President for the year 1940-1941.

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